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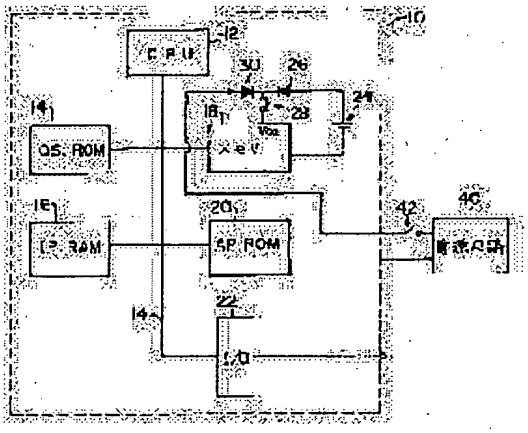
(54) START PROGRAM PROTECTING METHOD

(57)Abstract:
PURPOSE: To prevent an illegal program, which is prepared without any permission, from being started by preventing a prescribed program from being started when it is detected that data are not stored.
CONSTITUTION: When using an electronic equipment by a user after factory forwarding, a CPU 12 executes an operating system(OS) stored in an OS RAM 14 and it is discriminated while referring to an initialization end flag of a prescribed address on a memory 18 whether this flag is set or not. When the initialize flag is set, data are read from the write area of system data in a memory 18, and by investigating whether these data are the same as the system data written by initialize processing or not, it is investigated whether the system data are existent on the memory 18 or not. When there are the relevant system data, an application program is not executed but processing is immediately finished. Thus, the electronic equipment can be prevented from being operated by any program excepting for the regular program.



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* NOTICES *

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CLAIMS

[Claim]
[Claim 1] The bootstrap protection technique characterized by starting the aforementioned predetermined program when the data defined beforehand are written in memory, it detects whether the aforementioned data are memorized by the aforementioned memory in case of activation of a predetermined program and it is detected that the data is not memorized.
[Claim 2] It is the bootstrap protection technique of the claim 1 publication which writing of the aforementioned data is performed by the program execution loaded from the exterior, and is characterized by eliminating this program after an execution end.
[Claim 3] The aforementioned memory is the bootstrap protection technique of the claim 1 publication characterized by intercepting the aforementioned current supply way when consist of volatile memory, it has the power which supplies supply voltage to the parts support in which this memory was mounted at least, and this memory, the current supply way to the aforementioned memory from this power is prepared between the aforementioned parts support and a substrate and the spacing of the aforementioned parts support and the aforementioned substrate is opened.
[Claim 4] The aforementioned memory is the bootstrap protection technique of the claim 1 publication characterized by intercepting the supply of power to the aforementioned memory by the change of state of the aforementioned switch when consist of volatile memory, it has the power which supplies supply voltage to the aforementioned memory, a switch is formed between the substrates in which the electronic parts with which a program etc. is memorized, and these electronic parts are mounted and the aforementioned electronic parts are removed from the aforementioned substrate.
[Claim 5] The aforementioned memory is the bootstrap protection technique of the claim 1 publication characterized by the aforementioned cell being omitted when consist of volatile memory, it has the cell which supplies power to the substrate in which this memory was mounted at least, and this memory, the aforementioned substrate and this substrate are ****ed between wrap substrates for this cell and the spacing of the aforementioned substrate and the aforementioned substrate is opened.
[Claim 6] The bootstrap protection technique characterized by to prepare the pilot switch which detects this, to answer the change of state of this pilot switch, to drive the aforementioned eraser, and to eliminate the content of the ROM in which the aforementioned deletion is possible of storage when it has the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible was mounted and the spacing of a wrap substrate and the aforementioned parts support is opened in this parts support.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed description]
[0001]
[Field of the Invention] this invention relates to the bootstrap protection technique which starts the technique of starting a predetermined program, especially protects this program from unjust exchange, unjust unjust reconstruction, decode, etc., etc.
[0002]
[Prior art] That [the device's / the latest electronic equipment or the latest industrial device] into which intelligent-ization built the microcomputer splendidly increases. In such a microcomputer inclusion device, various functions-izing and individualization of a function are possible by program control.
[0003] For this reason, the content of the program currently written in ROM (read only memory) of the microcomputer built into the device serves as the secret matter important for each company, in what achieves the function especially with the important program, other companies will decode ******** unlawfully or, as for being copied, the reliability of the product will become weaker.
[0004] Moreover, it is also a big wound for a company that ROM in which the program was written is unfairly substitutable, it is made to add a part of function, or functional change is achieved.
[0005]
[Object of the Invention] However, the actual condition is that sufficient measures against protection are not conventionally taken in the device by which the above-mentioned **** microcomputer was incorporated to the illegal decode or the illegal copy of a program (for example, application program) which were written in ROM. Moreover, sufficient protection is not given to unjust substitution of ROM in which the program was written.
[0006] If it will not be made not to operate the device if this invention is not the regular program which should originally be included in a device in view of the above actual condition, namely, it puts in another way, it will aim at being unable to start the unjust program created without notice by the device, and being made to become.
[0007] Furthermore, when it is going to take out ROM in which a device is unlawfully converted into and the program was written utterly, the device sets it as other purposes that it is made not to operate normally henceforth.
[0008] Moreover, it sets it as the purpose of further others to forbid decode of the program written in ROM mounted in the device, and to prevent a creation of an unjust program (soft).
[0009]
[The means for solving a technical problem] Invention of claim 1 publication is characterized by starting the aforementioned predetermined program, when the data defined beforehand are written in memory, it detects whether the aforementioned data are memorized by the aforementioned memory in case of activation of a predetermined program and it is detected that the data is not memorized.
[0010] The above-mentioned predetermined program is a program beforehand included in a certain electronic equipment, for example. Invention of claim 2 publication is performed for the writing of the aforementioned data in invention of the claim 1 above-mentioned publication by the program execution loaded from the exterior, and this program is characterized by being eliminated after an execution end.
[0011] The loading of the above-mentioned program is performed from external storage, such as a floppy disk drive unit and a hard disk drive unit. Invention of claim 3 publication consists of the memory of a volatility [memory / aforementioned] in invention of the claim 1 above-mentioned publication. It has the power which supplies supply voltage to the parts support in which this memory was mounted at least, and this memory. When the current supply way to the aforementioned memory from this power is prepared between the aforementioned parts support and a substrate and the spacing of the aforementioned parts support and the aforementioned substrate is opened, it is characterized by intercepting the aforementioned current supply way.
[0012] The above-mentioned current supply way contains for example, a connection connector or a screw. Moreover, the above-mentioned parts support may be a printed circuit board. When the aforementioned memory consists of volatile memory, invention of claim 4 publication has the power which supplies supply voltage to the aforementioned memory, and forms a switch in invention of the claim 1 above-mentioned publication between the substrates in which the electronic parts with which a program etc. is memorized, and these electronic parts are mounted and the aforementioned electronic parts are removed from the aforementioned substrate, it carries out intercepting the supply of power to the aforementioned memory by the change of state of the aforementioned switch as the characteristic feature.
[0013] The above-mentioned electronic parts are ROMs (Read Only Memory) in which the application program

for for example, electronic equipment inclusion is written. In invention of the claim 1 above-mentioned publication, invention of claim 5 publication is characterized by the aforementioned cell being omitted, when the aforementioned memory consists of volatile memory, it has the cell which supplies power to the substrate in which this memory was mounted at least, and this memory, the aforementioned substrate and the aforementioned substrate are ****ed between wrap substrates for this cell and the spacing of the aforementioned substrate and the aforementioned substrate is opened.
[0014] The above-mentioned substrate may be a printed circuit board. It carries out that invention of claim 6 publication prepares the pilot switch which detects this, answers the change of state of this pilot switch, drives the aforementioned eraser, and eliminates the content of the ROM in which the aforementioned deletion is possible of storage when it has the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible was mounted and the spacing of a wrap substrate and the aforementioned parts support is opened in this parts support as the characteristic feature
[0015] ROM in which the above-mentioned deletion is possible consists of ultraviolet-rays deletion [for example,] type EPROM (Erasable Pro-grammable ROM), and the above-mentioned eraser consists of black lights, such as the stroboscopic tube which irradiates ultraviolet rays, in this case. Moreover, the above-mentioned pilot switch consists of a microswitch. moreover, ROM in which the above-mentioned deletion is possible -- for example, EEPROM (Electrically Erasable Programmable ROM) you may be .
[0016]
[Operation] In invention of the claim 1 above-mentioned publication, the data defined beforehand are written in memory (it is henceforth expressed as data memory for convenience). And if it detects whether the aforementioned data are memorized by the aforementioned data memory and the data is not memorized in case a predetermined program is started, activation of the aforementioned predetermined program is not performed.
[0017] The predetermined program for [above-mentioned] a microcomputer control which follows, for example, is included in the electronic equipment of a microcomputer control (it is henceforth expressed as a microcomputer control) Decode or reconstruction, When it is going to remove the memory (it is henceforth expressed as program memory for convenience) by which the above-mentioned predetermined program is written in still another program for the inaccurate purpose, such as exchange ******, from the substrate in the above-mentioned electronic equipment, When the aforementioned data memorized in the above-mentioned data memory were eliminated and the above unjust action is performed, it can avoid operating the above-mentioned electronic equipment normally henceforth. If it puts in another way, it can avoid operating the above-mentioned electronic equipment except a regular program.
[0018] moreover, invention of claim 2 publication -- setting -- the account of the above-mentioned memory top -- the program execution loaded from the exterior performs the writing of the data defined beforehand, and this program is immediately eliminated after the execution end
[0019] therefore, the thing for which the above data write-in processings are performed at the time of factory shipments -- after product shipment -- a third person -- the above-mentioned memory -- the account of a top -- it becomes almost impossible to write in the data defined beforehand For this reason, when the above unjust action is performed by eliminating the above-mentioned data when the action which removes the memory in which the above-mentioned predetermined program was written from a substrate is done in order to convert a device unfairly as mentioned above, the device can be prevented from operating normally henceforth.

[0020] Moreover, in invention of claim 3 publication, the power which supplies supply voltage to the parts support in which this data memory was mounted at least as the aforementioned data memory using volatile memory, and this data memory is prepared, and the current supply way to the aforementioned data memory from this power is further prepared between the aforementioned parts support and a substrate. And when the spacing of the aforementioned parts support and the aforementioned substrate is opened, the aforementioned current supply way is intercepted. For this reason, since supply of the supply voltage to data memory stops, the aforementioned data memorized by the data memory are eliminated.
[0021] Therefore, in case the aforementioned program memory is mounted on the aforementioned substrate and the program memory is taken out from the substrate, the same effect as invention of the claim 1 above-mentioned publication is acquired by making it a configuration which the spacing of the aforementioned parts support and the aforementioned substrate surely opens and by which the aforementioned current supply way is intercepted.
[0022] In invention of claim 4 publication, the power which supplies supply voltage to the aforementioned data memory as the aforementioned data memory using volatile memory is prepared, and a switch is formed between the substrates in which the electronic parts with which a program etc. is memorized further, and these electronic parts are mounted. And when the aforementioned electronic parts are removed from the aforementioned substrate, supply of the supply voltage to the aforementioned memory is made to intercept by the change of state of the aforementioned switch. Thereby, the aforementioned data memorized by the aforementioned data memory are eliminated.
[0023] It is going to convert, exchange or decode the above-mentioned predetermined program unlawfully by following, for example, making the above-mentioned electronic parts into the above-mentioned program memory, and if the action which removes the above-mentioned program memory from the above-mentioned substrate is performed, the electronic equipment in which the program memory is mounted for the above-

mentioned ground will stop operating normally henceforth.
[0024] In invention of claim 5 publication, the cell which supplies supply voltage to the substrate in which this data memory was mounted at least as the aforementioned data memory using volatile memory, and this data memory is formed, and it considers as the configuration by which this cell is ****ed between the aforementioned substrate and a substrate. For this reason, if the spacing of the aforementioned substrate and the aforementioned substrate is opened, the aforementioned cell will be omitted and, thereby, the aforementioned data memorized by the aforementioned data memory will be eliminated.
[0025] Therefore, when the aforementioned program memory tends to be mounted on the aforementioned substrate and it is going to remove the program memory from the substrate, the same effect as invention of the claim 1 above-mentioned publication is acquired by surely considering as a configuration which the spacing of the substrate and the aforementioned substrate opens.
[0026] In invention of claim 6 publication, when the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible was mounted is prepared and the spacing of a wrap substrate and the aforementioned parts support is further opened in this parts support, the pilot switch which detects this is prepared. And the change of state of this pilot switch is answered, the aforementioned eraser is driven, and the content of storage of ROM in which the aforementioned deletion is possible is eliminated.
[0027] Therefore, if the program included in the electronic equipment of a microcomputer control is stored in ROM in which the above-mentioned deletion is possible, and the program tends to be decoded and it is going to open the above-mentioned substrate utterly, the above-mentioned pilot switch will operate and the above-mentioned program currently written in the above-mentioned ROM by the above-mentioned eraser will be eliminated. And thereby, decode of the above-mentioned program becomes impossible.
[0028]
[Example] Hereafter, the example of this invention is explained, referring to a drawing. Drawing 1 is the circuit block diagram showing the system configuration of the electronic equipment which is one example of this invention.
[0029] In this drawing, the circuit 10 surrounded with the dashed line is mounted in 1 or two or more printed-circuit-board superiors. This circuit 10 is equipped with OS.ROM16 connected with CPU12 and this CPU12 by bus 14, IP.RAM18, the memory 18, AP.ROM20, and I/O controller 22.
[0030] OS.ROM16 consists of ROMs (read only memory), such as a mask ROM (mask Read Only Memory), and the operating system (OS) performed by CPU12 is stored.
[0031] IP. RAM16 is RAM (random access memory) which stores the initializer inputted through I/O controller 22. Memory 18 is volatile memory and supply voltage is supplied to it from the power circuit 40 of the exterior which is usually main power. And when the switch 42 of this power circuit 40 becomes off and supply of the supply voltage from a power circuit 40 stops, data are held by receiving supply of supply voltage from the cell 24 which is a backup power supply and which consists, for example of a rechargeable battery. The plus electrode of this cell 24 is connected to the anode of diode 26, and the supply voltage from the above-mentioned cell 24 is supplied to memory 18 through this diode 26 and switch 28. On the other hand, the supply voltage from a power circuit 40 is supplied to memory 18 through a line rocker switch 42, another diode 30, and the above-mentioned switch 28.
[0032] AP.ROM20 is ROM in which the predetermined application program was written, and by irradiation of ultraviolet rays, a batch deletion of data is possible for it, and it is EPROM (Erasable and Programmable Read Only Memory) in which the re-writing of data is also possible.
[0033] I/O controller 22 controls I/O of the data between CPU12, and external storage, such as a floppy disk drive unit and a hard disk drive unit, and other peripheral devices.
[0034] A power circuit 40 is a switching power supply (Switing Power Suplly). It is the direct-current regulated power supply which consists of a grade, and the DC-power-supply voltage is supplied to CPU12, OS.ROM14, IP.RAM16, AP.ROM20, and I/O controller 22 in addition to the above-mentioned memory 18.
[0035] Next, an operation of the electronic equipment of the above-mentioned configuration is explained, referring to the flow chart of drawing 2 . First, this electronic equipment processes SA surrounded and shown in this drawing with a dashed line before shipment.
[0036] This processing SA is initialization processing of the system for preventing unjust exchange of AP.ROM20. First, if a line rocker switch 42 is set as ON, CPU12 will perform OS (operating system) stored in OS.ROM14, and it will distinguish whether the initialization ending flag is set with reference to the predetermined address as which memory 18 was determined beforehand first (SA1). This initialization ending flag is a 1-bit flag.
[0037] In this phase, still, since the initialization ending flag is not set (SA1, NO), it loads an initializer to IP.RAM16 through I/O controller 22 from the storage of the non-illustrated exterior at a degree (SA2).
[0038] CPU12 starts this initializer continuously (SA3), and the system data defined beforehand is written in the predetermined field of memory 18 by execution of this initializer (SA4). This system data is a words [several] predetermined character string.
[0039] Then, the aforementioned initializer loaded on IP.RAM16 is eliminated (SA5), and, next, the above-mentioned initialization ending flag of the predetermined address of memory 18 is set (SA6).
[0040] In case the above-mentioned electronic equipment is shipped from the works by the above initialization processing SAs of a system, while the initialization ending flag is set by them, the above-mentioned system

data is written in the predetermined field of memory 18 by them. In addition, since a cell 24 is mounted at the time of factory shipments, and a switch 28 is also set as ON and memory 18 is backed up, the status of the system data written in the predetermined field of this memory 18 and an initialization ending flag is held.
[0041] Next, an operation of the above-mentioned electronic equipment when being used by the user after factory shipments is explained, referring to the flow chart of drawing 3 similarly. If a line rocker switch 42 is turned ON in order that an user may use the above-mentioned electronic equipment, supply voltage will be supplied to all the electronic parts of the circuit 10 surrounded with the dashed line of drawing 1 from the power circuit 40, and CPU12 will perform the operating system stored in OS.ROM14. Thereby, CPU12 distinguishes first whether this initialization ending flag is set with reference to the initialization ending flag of the predetermined address on memory 18 (SA1).
[0042] And if the initialization flag is set (SA1, YES), data will be read from the write-in field of the system data of memory 18 (SB1), and it will investigate whether a system data is on memory 18 by investigating whether it is the same as that of the system data with which this data was written in by the aforementioned processing SA (SB2).
[0043] And if there is the above-mentioned applicable system data, an application program will be read from AP.ROM20 and this application program will be started (SB3).
[0044] Thus, only when the initialization ending flag is set to memory 18 and the applicable system data is written in, the application program stored in AP and ROM20 is performed.
[0045] On the other hand, when there is no system data which corresponds at the above-mentioned step SB2, execution of the above-mentioned application program is not performed, but processing is ended immediately. In this example, when the unjust action which removes above-mentioned AP.ROM20 from a printed circuit board for the inaccurate purpose of decoding or converting the above-mentioned application program after factory shipments is performed so that it may mention later, it is the structure from which it is eliminated, the content, i.e., aforementioned system data, of memory 18.
[0046] It becomes impossible therefore, to start the application program stored in AP.ROM20, when the above unjust action is performed. Moreover, since the double check of an initialization flag and a system data is performed in this example, the above unjust action is forbidden severely. Moreover, when the above-mentioned initialization ending flag is made into a bit flag, this is also a cure for it, accidental (soft error by the human action or alpha rays etc.), or since there may also be a situation where the above-mentioned initialization flag will be set intentionally, after performing the above unjust action.
[0047] Furthermore, after performing the above-mentioned initializer and finishing setting this initialization ending flag before factory shipments as mentioned above in order to expect safety, the above-mentioned initializer is eliminated immediately and the purchaser of this electronic equipment has taken the measures which cannot use this initializer (SA5 of the flow chart of drawing 2).
[0048] Next, the example of a package of the example of a configuration of being shown in above-mentioned drawing 1 and drawing 2 is shown in drawing 3 or drawing 5 . Drawing 3 is the side elevation showing an example of the package gestalt of this example. In this drawing, the screw setting of the printed circuit board (PCB) 60 of the top in which the printed circuit board (PCB) 50 and the cell 24 of the bottom in which memory 18 was mounted were mounted is carried out on a screw 70 in four corners, and it is ****ed in the status counter. Moreover, in the center of PCB50 and PCB60, male form connector 80D and female form connector 80U are drooped, respectively, and such connector 80D and connector 80U are made mutual a fitting and connection in the above-mentioned **** status.
[0049] Male form connector 80D drooped on PCB50 is connected to the terminal Vcc of memory 18 through the printed circuit 52 formed on this PCB50. On the other hand, female form connector 80U drooped on PCB60 is connected to the plus electrode of a cell 24, and the line rocker switch 42 of a power circuit 40 through the printed circuit 62 formed on PCB60. Moreover, the above-mentioned cell 24 supports the edge by the base material 90 embedded at PCB60 so that it may not drop out of PCB60. Moreover, although not illustrated especially, AP.ROM20 is also mounted on PCB50.
[0050] In the above configurations, the above-mentioned male form connector 80D and female form connector 80U correspond to the switch 28 shown in drawing 1 . Since it is in the above package status, in order to remove AP.ROM20 from PCB50, after extracting a screw 70 from PCB50 and PCB60, it is necessary to open PCB50. However, if it does in this way and PCB50 is opened, the fitting of male form connector 80D and female form connector 80U will separate, and supply of the supply voltage from the cell 24 or the power circuit 40 to memory 18 will be intercepted. And as a result, all the content of storage of memory 18 is eliminated. And as a result, while the aforementioned system data currently written in memory 18 is eliminated, an initialization ending flag will be reset.
[0051] Therefore, for the purpose of converting unjustly the application program currently written in AP.ROM20, if AP.ROM20 is unfairly taken out from the inside of a device, a device will stop operating normally henceforth. For this reason, it becomes impossible to start the inaccurate application program created without notice by this device.
[0052] In addition, above-mentioned PCB60 may be the up case of a device. Next, drawing 4 is drawing showing other examples of a package of the example shown in above-mentioned drawing 1 and drawing 2 . This drawing (a) Memory 18, AP.ROM20, etc. which are shown in drawing 1 are mounted in the front face of the printed-circuit substrate (PCB) 101 so that it may be shown, and it is drawing 4 (a). The through hole is prepared so that it may be shown in the center. This drawing (b) On the front face of PCB101 around this through hole, and

the rear face, ring-like the surface pad (conductor land) 102 and the rear-face pad (conductor land) 103 are formed, respectively so that it may be shown. The path of these pads 102,103 is large rather than the path of the above-mentioned through hole, and these pads 102 and pads 103 are not electrically connected through this through hole. Moreover, this surface pad 103 is electrically connected with the above-mentioned memory 18 by the printed circuit which is not illustrated [which was formed in the surface section of PCB101]. On the other hand, this rear-face pad 102 is electrically connected with the cathode of the diode 30 shown in drawing 1 , and the diode 26 through the printed circuit which is not illustrated [which was formed in the rear face and front face of PCB101], and the non-illustrated through hole.

[0053] The front-face side of above-mentioned PCB101 is covered in the case 120. The bore side of the hollow height 121 of this case 120 serves as the cavity, and the insertion nut 123 which consists of a conductive component is embedded in the cavity. And above-mentioned PCB101 and the above-mentioned case 120 fix by ****ing the screw 140 which changes from a conductive component to the insertion nut 123 in the hollow height 121 of the above-mentioned case 120 through the through hole of this PCB101. In addition, in this **** status, the spring 125 which consists of a conductive component is ****ed between the surface sections of PCB101 which counters the above-mentioned insertion nut 123 and this. Moreover, in this fixing status, the head of a screw 140 touches the above-mentioned rear-face pad 103 by the rear-face side of PCB101. Therefore, in the status that PCB101 and the case 120 fixed with the screw 140 and the insertion nut 123 in this way, since the rear-face pad 102 and the surface pad 103 are electrically connected through a screw 140, the insertion nut 123, and the spring 125, it is backed up by the cell 24 while supply voltage is supplied to memory 18 from a power circuit 140.

[0054] In the above-mentioned configuration, a pad 102,103, the insertion nut 121, the spring 125, and the screw 140 correspond to the switch 28 shown in drawing 1 . As mentioned above, since AP.ROM20 is mounted in the surface section side of PCB101, in order to remove AP.ROM20 from PCB101, it needs to remove a screw 140. However, if a screw 140 is removed, since the rear-face pad 102 and the surface pad 103 which had been conducted through this screw 140 will be in non-continuity, supply of the supply voltage from the power circuit 40 and the cell 24 to memory 18 will be intercepted, and all the content of storage of memory 18 will be eliminated.

[0055] Thus, also in the example of a package shown in drawing 4 , if this AP.ROM20 is removed from PCB101 for the unjust purpose of exchanging AP.ROM20 for other AP.ROMs, this electronic equipment will never stop operating.

[0056] Next, drawing 5 is drawing showing the example of a package of further others of the example of a configuration of being shown in above-mentioned drawing 1 and drawing 2 . At this example, it is drawing 5 (a). IC socket 220 for AP.ROM21 insertion is inserted in a part of PCB210 in which the electronic parts of each block shown in drawing 1 so that it may be shown were mounted. Moreover, the microswitch 230 which corresponds to the switch 28 of drawing 1 inside this IC socket 220 is ****ed. The height of the push button 231 of this microswitch 230 is set as a height which this microswitch 230 is pushed and is turned on, when AP.ROM21 is inserted in this IC socket 220.

[0057] Therefore, since the switch 28 shown in drawing 1 at the time of factory shipments is switched on, a predetermined constant voltage is supplied from the cell 24 whose memory 18 mounted in PCB210 is a backup power supply. For this reason, while the system data written in memory 18 is held, an initialization ending flag is also held at the set status.

[0058] And for the inaccurate purpose of a certain purchaser exchanging AP.ROM20 for other AP.ROMs unfairly after factory shipments, if the AP.ROM20 is ****ed from IC socket 220, a microswitch 230 will become off and supply of the supply voltage to the memory 18 from the power circuit 40 and the cell 24 will be intercepted. And as this result, since all the content of storage of memory 18 is eliminated, a system data is also eliminated and an initialization ending flag is also reset.

[0059] Therefore, the same effect as the example shown in drawing 3 and drawing 4 which were mentioned above is acquired. Next, as shown in drawing 6 , the example of a package in case the power which supplies supply voltage to memory 18 in the circuit shown in drawing 1 consists only of a cell 24 is shown in drawing 7 .

[0060] in this drawing, the printed circuit board (PCB) 250 in which memory 18 was mounted, and other printed circuit boards (PCB) 260 carry out the screw setting of each four corners on a screw 270 — having — a predetermined spacing — it is fixed mutually, separating

[0061] In this fixed status, the elastic component 280 is ****ed on this PCB250, and the cell 24 is ****ed between this elastic component 280 and above-mentioned PCB260. Moreover, the wiring component which is not illustrated [which fixed on the front face of the printed circuit 252 formed on PCB250 and the elastic component 280] connects electrically, and the memory 18 mounted in PCB250 and the above-mentioned cell 24 back up memory 18 from a cell 24 by it. Moreover, although not illustrated especially, AP.ROM20 is also mounted on PCB250. For this reason, in order to take out AP.ROM20, it has the structure where any of PCB250 and PCB260 by which screw setting is carried out on the screw 270, or one side must be opened. In the above configurations, the contact section with the wiring component which is not illustrated [which fixed in the plus terminal and the above-mentioned elastic component 280 of a cell 24] corresponds to the switch 28 of drawing 1 .

[0062] And if someone removes a screw 270 and opens PCB260 or PCB250 for the inaccurate purpose of exchanging AP.ROM20 for another AP.ROM unfairly when it is in the status which shows in drawing 4 , the cell 24 which had appeared in the unstable status on the elastic component 280 will be omitted from on the elastic

component 280, and supply of the supply voltage to memory 18 will stop from this cell 24. While the above-mentioned system data memorized by memory 18 is eliminated by this, an initialization setting flag is reset. Consequently, it becomes impossible to perform the application program currently again written in AP.ROM20 by this system though returned to the status which shows in drawing 7 again like the example shown in above-mentioned drawing 3 or drawing 5 . Moreover, execution of the application program written in AP.ROM for which it was exchanged unfairly also becomes impossible.

[0063] In addition, if the component which has conductivity as the above-mentioned elastic component 280 is used, the above-mentioned wiring component will become unnecessary. Next, or drawing 8 tends to decode unjustly the program currently written in AP.ROM20, it is drawing showing the example of a package of the electronic equipment which prevents the unjust action of the AP.ROM20 being unfairly exchanged for other AP.ROMs, and operating electronic equipment by another application program.

[0064] In this drawing, like the example shown in drawing 7 mentioned above, screw setting is carried out on a screw 330, only the distance of a predetermined spacing separates each four corners mutually, and two PCB310 and PCB320 are being fixed.

[0065] above-mentioned PCB310 top -- EPROM (Erasable and Programmable Read OnlyMemory) **** -- AP.ROM20 which changes is mounted Moreover, when the power of about 15 W is supplied on this AP.ROM20, the stroboscopic tube 340 for eliminating the stored data of above-mentioned AP.ROM20 to which wavelength irradiates the ultraviolet rays of about 2357 ** for about 0.96 seconds carries and fixes. Furthermore, between above-mentioned PCB310 and above-mentioned PCB320, ** arrival of the insulating component 350 which the end fixed in above-mentioned PCB320 is carried out, and the nose of cam of the 1st conductive component 360 which has the rigidity which the part fixed on PCB310, and the 2nd conductive component 370 is this **ing on both sides of this insulating component 350. The nose of cam of these conductive components 360,370 is bent in the shape of a semicircle so that it may have elasticity. Therefore, if the above-mentioned insulating component 350 is removed, the nose of cam of the two above-mentioned conductive components 360 and 370 will contact mutually. That is, the three above-mentioned components 350,360,370 constitute one pilot switch.

[0066] The other end of the above-mentioned conductive component 360 is connected with the power input terminal of the above-mentioned stroboscopic tube 340, and the other end of another conductive component 370 is connected to the non-illustrated cell through the printed circuit formed on PCB310.

[0067] Thus, since AP.ROM20 is ****ed between PCB310 and PCB320, in order to take out AP.ROM20, it needs to remove a screw 330 and needs to open PCB320. However, since the insulating component 350 will also be drawn out with PCB320 if such action is performed, each nose of cam of the conductive component 360 and the conductive component 370 contacts for the above grounds, and the drive power of about 15 W is supplied to the stroboscopic tube 340 from the aforementioned cell. All the content by which the ultraviolet rays of about 2357 ** were irradiated by the ultraviolet-rays transparency aperture of AP.ROM20 which consists of the stroboscopic tube 340 to EPROM for about 0.96 seconds, and wavelength was written by this in it at AP.ROM20, i.e., the content of an application program, is eliminated. Therefore, decode of the application program written in AP.ROM20 of the shipped electronic equipment becomes impossible.

[0068] In addition, in this example, although EPROM is used for AP.ROM20, you may use EEPROM (Electrically Erasable Programmable ROM) instead of EPROM. In this case, the switch which detects what above-mentioned PCB320 was able to open, for example is formed, and it considers as a configuration whose microprocessor the signal from this pilot switch is received and eliminates the content of storage of the above-mentioned EEPROM.

[0069] Moreover, as a modification of the example shown in aforementioned drawing 5 , ICs other than AP.ROM20 (for example, memory 18) are inserted in above-mentioned IC socket 220, and it may be made to eliminate all the content of storage of AP.ROM20 which consists of eliminable ROM of EPROM or EEPROM by the detecting signal of the microswitch 230 at the time of the IC being sampled from IC socket 220. When it considered as such a configuration, above-mentioned IC socket 220 was equipped with memory 18 and the unjust action is performed to the electronic equipment after shipment, the deletion not only of the content of AP.ROM20 but the content of memory 18 is attained simultaneously.

[0070]

[Effect of the invention] As explained above, according to invention the claim 1 or given in five, write the data defined beforehand in memory and activation of a predetermined program is faced. When it detects whether the aforementioned data are memorized in the aforementioned memory and it is detected that the data is not memorized Since it is made not to start the aforementioned predetermined program, it can avoid starting the unjust program created without notice in the electronic equipment of a microcomputer control (if it is not a regular program, it can avoid making it (operating)). Moreover, when it is going to convert the above-mentioned electronic equipment unlawfully and the interior is opened, the electronic equipment can be prevented from operating normally henceforth.

[0071] It has the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible in invention of claim 6 publication was mounted. When the spacing of a wrap substrate and the aforementioned parts support is opened, this parts support Since prepare the pilot switch which detects this, the change of state of this pilot switch is answered, the aforementioned eraser is driven and the content of storage of ROM in which the aforementioned deletion is possible was eliminated In the electronic equipment by which the microcomputer is incorporated, decode of the program mounted in the device can be forbidden, and an unjust soft creation can

be prevented.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] this invention relates to the bootstrap protection technique which starts the technique of starting a predetermined program, especially protects this program from unjust exchange, unjust unjust reconstruction, decode, etc., etc.

[Translation done.]

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PRIOR ART

[Prior art] That [the device's / the latest electronic equipment or the latest industrial device] into which intelligent-ization built the microcomputer splendidly increases. In such a microcomputer inclusion device, various functions-izing and individualization of a function are possible by program control.
[0003] For this reason, the content of the program currently written in ROM (read only memory) of the microcomputer built into the device serves as the secret matter important for each company, in what achieves the function especially with the important program, other companies will decode ******** unlawfully or, as for being copied, the reliability of the product will become weaker.
[0004] Moreover, it is also a big wound for a company that ROM in which the program was written is unfairly substitutable, it is made to add a part of function, or functional change is achieved.

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EFFECT OF THE INVENTION

[Effect of the invention] As explained above, according to invention the claim 1 or given in five, write the data defined beforehand in memory and activation of a predetermined program is faced. When it detects whether the aforementioned data are memorized in the aforementioned memory and it is detected that the data is not memorized Since it is made not to start the aforementioned predetermined program, it can avoid starting the unjust program created without notice in the electronic equipment of a microcomputer control (if it is not a regular program, it can avoid making it (operating)). Moreover, when it is going to convert the above-mentioned electronic equipment unlawfully and the interior is opened, the electronic equipment can be prevented from operating normally henceforth.
[0071] It has the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible in invention of claim 6 publication was mounted. When the spacing of a wrap substrate and the aforementioned parts support is opened, this parts support Since prepare the pilot switch which detects this, the change of state of this pilot switch is answered, the aforementioned eraser is driven and the content of storage of ROM in which the aforementioned deletion is possible was eliminated In the electronic equipment by which the microcomputer is incorporated, decode of the program mounted in the device can be forbidden, and an unjust soft creation can be prevented.

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TECHNICAL PROBLEM

[Object of the Invention] However, the actual condition is that sufficient measures against protection are not conventionally taken in the device by which the above-mentioned **** microcomputer was incorporated to the illegal decode or the illegal copy of a program (for example, application program) which were written in ROM. Moreover, sufficient protection is not given to unjust substitution of ROM in which the program was written.
[0006] If it will not be made not to operate the device if this invention is not the regular program which should originally be included in a device in view of the above actual condition, namely, it puts in another way, it will aim at being unable to start the unjust program created without notice by the device, and being made to become.
[0007] Furthermore, when it is going to take out ROM in which a device is unlawfully converted into and the program was written utterly, the device sets it as other purposes that it is made not to operate normally henceforth.
[0008] Moreover, it sets it as the purpose of further others to forbid decode of the program written in ROM mounted in the device, and to prevent a creation of an unjust program (soft).

[Translation done.]

* NOTICES *

MEANS

[The means for solving a technical problem] Invention of claim 1 publication is characterized by starting the aforementioned predetermined program, when the data defined beforehand are written in memory, it detects whether the aforementioned data are memorized by the aforementioned memory in case of activation of a predetermined program and it is detected that the data is not memorized.
[0010] The above-mentioned predetermined program is a program beforehand included in a certain electronic equipment, for example. Invention of claim 2 publication is performed for the writing of the aforementioned data in invention of the claim 1 above-mentioned publication by the program execution loaded from the exterior, and this program is characterized by being eliminated after an execution end.
[0011] The loading of the above-mentioned program is performed from external storage, such as a floppy disk drive unit and a hard disk drive unit. Invention of claim 3 publication consists of the memory of a volatility [memory / aforementioned] in invention of the claim 1 above-mentioned publication. It has the power which supplies supply voltage to the parts support in which this memory was mounted at least, and this memory. When the current supply way to the aforementioned memory from this power is prepared between the aforementioned parts support and a substrate and the spacing of the aforementioned parts support and the aforementioned substrate is opened, it is characterized by intercepting the aforementioned current supply way.
[0012] The above-mentioned current supply way contains for example, a connection connector or a screw. Moreover, the above-mentioned parts support may be a printed circuit board. When the aforementioned memory consists of volatile memory, invention of claim 4 publication has the power which supplies supply voltage to the aforementioned memory, and forms a switch in invention of the claim 1 above-mentioned publication between the substrates in which the electronic parts with which a program etc. is memorized, and these electronic parts are mounted and the aforementioned electronic parts are removed from the aforementioned substrate, it carries out intercepting the supply of power to the aforementioned memory by the change of state of the aforementioned switch as the characteristic feature.
[0013] The above-mentioned electronic parts are ROMs (Read Only Memory) in which the application program for for example, electronic equipment inclusion is written. In invention of the claim 1 above-mentioned publication, invention of claim 5 publication is characterized by the aforementioned cell being omitted, when the aforementioned memory consists of volatile memory, it has the cell which supplies power to the substrate in which this memory was mounted at least, and this memory, the aforementioned substrate and the aforementioned substrate are ****ed between wrap substrates for this cell and the spacing of the aforementioned substrate and the aforementioned substrate is opened.
[0014] The above-mentioned substrate may be a printed circuit board. It carries out that invention of claim 6 publication prepares the pilot switch which detects this, answers the change of state of this pilot switch, drives the aforementioned eraser, and eliminates the content of the ROM in which the aforementioned deletion is possible of storage when it has the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible was mounted and the spacing of a wrap substrate and the aforementioned parts support is opened in this parts support as the characteristic feature
[0015] ROM in which the above-mentioned deletion is possible consists of ultraviolet-rays deletion [for example,] type EPROM (Erasable Pro-grammable ROM), and the above-mentioned eraser consists of black lights, such as the stroboscopic tube which irradiates ultraviolet rays, in this case. Moreover, the above-mentioned pilot switch consists of a microswitch. moreover, ROM in which the above-mentioned deletion is possible -- for example, EEPROM (Electrically Erasable Programmable ROM) you may be .

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OPERATION

[Operation] In invention of the claim 1 above-mentioned publication, the data defined beforehand are written in memory (it is henceforth expressed as data memory for convenience). And if it detects whether the aforementioned data are memorized by the aforementioned data memory and the data is not memorized in case a predetermined program is started, activation of the aforementioned predetermined program is not performed.
[0017] The predetermined program for [above-mentioned] a microcomputer control which follows, for example, is included in the electronic equipment of a microcomputer control (it is henceforth expressed as a microcomputer control) Decode or reconstruction, When it is going to remove the memory (it is henceforth expressed as program memory for convenience) by which the above-mentioned predetermined program is written in still another program for the inaccurate purpose, such as exchange ******, from the substrate in the above-mentioned electronic equipment, When the aforementioned data memorized in the above-mentioned data memory were eliminated and the above unjust action is performed, it can avoid operating the above-mentioned electronic equipment normally henceforth. If it puts in another way, it can avoid operating the above-mentioned electronic equipment except a regular program.
[0018] moreover, invention of claim 2 publication -- setting -- the account of the above-mentioned memory top -- the program execution loaded from the exterior performs the writing of the data defined beforehand, and this program is immediately eliminated after the execution end
[0019] therefore, the thing for which the above data write-in processings are performed at the time of factory shipments -- after product shipment -- a third person -- the above-mentioned memory -- the account of a top -- it becomes almost impossible to write in the data defined beforehand For this reason, when the above unjust action is performed by eliminating the above-mentioned data when the action which removes the memory in which the above-mentioned predetermined program was written from a substrate is done in order to convert a device unfairly as mentioned above, the device can be prevented from operating normally henceforth.

[0020] Moreover, in invention of claim 3 publication, the power which supplies supply voltage to the parts support in which this data memory was mounted at least as the aforementioned data memory using volatile memory, and this data memory is prepared, and the current supply way to the aforementioned data memory from this power is further prepared between the aforementioned parts support and a substrate. And when the spacing of the aforementioned parts support and the aforementioned substrate is opened, the aforementioned current supply way is intercepted. For this reason, since supply of the supply voltage to data memory stops, the aforementioned data memorized by the data memory are eliminated.
[0021] Therefore, in case the aforementioned program memory is mounted on the aforementioned substrate and the program memory is taken out from the substrate, the same effect as invention of the claim 1 above-mentioned publication is acquired by making it a configuration which the spacing of the aforementioned parts support and the aforementioned substrate surely opens and by which the aforementioned current supply way is intercepted.
[0022] In invention of claim 4 publication, the power which supplies supply voltage to the aforementioned data memory as the aforementioned data memory using volatile memory is prepared, and a switch is formed between the substrates in which the electronic parts with which a program etc. is memorized further, and these electronic parts are mounted. And when the aforementioned electronic parts are removed from the aforementioned substrate, supply of the supply voltage to the aforementioned memory is made to intercept by the change of state of the aforementioned switch. Thereby, the aforementioned data memorized by the aforementioned data memory are eliminated.
[0023] It is going to convert, exchange or decode the above-mentioned predetermined program unlawfully by following, for example, making the above-mentioned electronic parts into the above-mentioned program memory, and if the action which removes the above-mentioned program memory from the above-mentioned substrate is performed, the electronic equipment in which the program memory is mounted for the above-mentioned ground will stop operating normally henceforth.
[0024] In invention of claim 5 publication, the cell which supplies supply voltage to the substrate in which this data memory was mounted at least as the aforementioned data memory using volatile memory, and this data memory is formed, and it considers as the configuration by which this cell is ****ed between the aforementioned substrate and a substrate. For this reason, if the spacing of the aforementioned substrate and the aforementioned substrate is opened, the aforementioned cell will be omitted and, thereby, the aforementioned data memorized by the aforementioned data memory will be eliminated.

[0025] Therefore, when the aforementioned program memory tends to be mounted on the aforementioned substrate and it is going to remove the program memory from the substrate, the same effect as invention of the claim 1 above-mentioned publication is acquired by surely considering as a configuration which the spacing of the substrate and the aforementioned substrate opens.
[0026] In invention of claim 6 publication, when the parts support in which the eraser which eliminates the content of storage of eliminable ROM which memorizes a program or data, and ROM in which this deletion is possible was mounted is prepared and the spacing of a wrap substrate and the aforementioned parts support is further opened in this parts support, the pilot switch which detects this is prepared. And the change of state of this pilot switch is answered, the aforementioned eraser is driven, and the content of storage of ROM in which the aforementioned deletion is possible is eliminated.
[0027] Therefore, if the program included in the electronic equipment of a microcomputer control is stored in ROM in which the above-mentioned deletion is possible, and the program tends to be decoded and it is going to open the above-mentioned substrate utterly, the above-mentioned pilot switch will operate and the above-mentioned program currently written in the above-mentioned ROM by the above-mentioned eraser will be eliminated. And thereby, decode of the above-mentioned program becomes impossible.

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EXAMPLE

[Example] Hereafter, the example of this invention is explained, referring to a drawing. Drawing 1 is the circuit block diagram showing the system configuration of the electronic equipment which is one example of this invention.
[0029] In this drawing, the circuit 10 surrounded with the dashed line is mounted in 1 or two or more printed-circuit-board superiors. This circuit 10 is equipped with OS.ROM16 connected with CPU12 and this CPU12 by bus 14, IP.RAM18, the memory 18, AP.ROM20, and I/O controller 22.
[0030] OS.ROM16 consists of ROMs (read only memory), such as a mask ROM (mask Read Only Memory), and the operating system (OS) performed by CPU12 is stored.
[0031] IP. RAM16 is RAM (random access memory) which stores the initializer inputted through I/O controller 22. Memory 18 is volatile memory and supply voltage is supplied to it from the power circuit 40 of the exterior which is usually main power. And when the switch 42 of this power circuit 40 becomes off and supply of the supply voltage from a power circuit 40 stops, data are held by receiving supply of supply voltage from the cell 24 which is a backup power supply and which consists, for example of a rechargeable battery. The plus electrode of this cell 24 is connected to the anode of diode 26, and the supply voltage from the above-mentioned cell 24 is supplied to memory 18 through this diode 26 and switch 28. On the other hand, the supply voltage from a power circuit 40 is supplied to memory 18 through a line rocker switch 42, another diode 30, and the above-mentioned switch 28.
[0032] AP.ROM20 is ROM in which the predetermined application program was written, and by irradiation of ultraviolet rays, a batch deletion of data is possible for it, and it is EPROM (Erasable and Programmable Read Only Memory) in which the re-writing of data is also possible.
[0033] I/O controller 22 controls I/O of the data between CPU12, and external storage, such as a floppy disk drive unit and a hard disk drive unit, and other peripheral devices.
[0034] A power circuit 40 is a switching power supply (Switing Power Suplly). It is the direct-current regulated power supply which consists of a grade, and the DC-power-supply voltage is supplied to CPU12, OS.ROM14, IP.RAM16, AP.ROM20, and I/O controller 22 in addition to the above-mentioned memory 18.
[0035] Next, an operation of the electronic equipment of the above-mentioned configuration is explained, referring to the flow chart of drawing 2 . First, this electronic equipment processes SA surrounded and shown in this drawing with a dashed line before shipment.
[0036] This processing SA is initialization processing of the system for preventing unjust exchange of AP.ROM20. First, if a line rocker switch 42 is set as ON, CPU12 will perform OS (operating system) stored in OS.ROM14, and it will distinguish whether the initialization ending flag is set with reference to the predetermined address as which memory 18 was determined beforehand first (SA1). This initialization ending flag is a 1-bit flag.
[0037] In this phase, still, since the initialization ending flag is not set (SA1, NO), it loads an initializer to IP.RAM16 through I/O controller 22 from the storage of the non-illustrated exterior at a degree (SA2).
[0038] CPU12 starts this initializer continuously (SA3), and the system data defined beforehand is written in the predetermined field of memory 18 by execution of this initializer (SA4). This system data is a words [several] predetermined character string.
[0039] Then, the aforementioned initializer loaded on IP.RAM16 is eliminated (SA5), and, next, the above-mentioned initialization ending flag of the predetermined address of memory 18 is set (SA6).
[0040] In case the above-mentioned electronic equipment is shipped from the works by the above initialization processing SAs of a system, while the initialization ending flag is set by them, the above-mentioned system data is written in the predetermined field of memory 18 by them. In addition, since a cell 24 is mounted at the time of factory shipments, and a switch 28 is also set as ON and memory 18 is backed up, the status of the system data written in the predetermined field of this memory 18 and an initialization ending flag is held.
[0041] Next, an operation of the above-mentioned electronic equipment when being used by the user after factory shipments is explained, referring to the flow chart of drawing 3 similarly. If a line rocker switch 42 is turned ON in order that an user may use the above-mentioned electronic equipment, supply voltage will be supplied to all the electronic parts of the circuit 10 surrounded with the dashed line of drawing 1 from the power circuit 40, and CPU12 will perform the operating system stored in OS.ROM14. Thereby, CPU12 distinguishes first whether this initialization ending flag is set with reference to the initialization ending flag of the predetermined address on memory 18 (SA1).
[0042] And if the initialization flag is set (SA1, YES), data will be read from the write-in field of the system data

of memory 18 (SB1), and it will investigate whether a system data is on memory 18 by investigating whether it is the same as that of the system data with which this data was written in by the aforementioned processing SA (SB2).
[0043] And if there is the above-mentioned applicable system data, an application program will be read from AP.ROM20 and this application program will be started (SB3).
[0044] Thus, only when the initialization ending flag is set to memory 18 and the applicable system data is written in, the application program stored in AP and ROM20 is performed.
[0045] On the other hand, when there is no system data which corresponds at the above-mentioned step SB2, execution of the above-mentioned application program is not performed, but processing is ended immediately. In this example, when the unjust action which removes above-mentioned AP.ROM20 from a printed circuit board for the inaccurate purpose of decoding or converting the above-mentioned application program after factory shipments is performed so that it may mention later, it is the structure from which it is eliminated, the content, i.e., aforementioned system data, of memory 18.
[0046] It becomes impossible therefore, to start the application program stored in AP.ROM20, when the above unjust action is performed. Moreover, since the double check of an initialization flag and a system data is performed in this example, the above unjust action is forbidden severely. Moreover, when the above-mentioned initialization ending flag is made into a bit flag, this is also a cure for it, accidental (soft error by the human action or alpha rays etc.), or since there may also be a situation where the above-mentioned initialization flag will be set intentionally, after performing the above unjust action.
[0047] Furthermore, after performing the above-mentioned initializer and finishing setting this initialization ending flag before factory shipments as mentioned above in order to expect safety, the above-mentioned initializer is eliminated immediately and the purchaser of this electronic equipment has taken the measures which cannot use this initializer (SA5 of the flow chart of drawing 2).
[0048] Next, the example of a package of the example of a configuration of being shown in above-mentioned drawing 1 and drawing 2 is shown in drawing 3 or drawing 5 . Drawing 3 is the side elevation showing an example of the package gestalt of this example. In this drawing, the screw setting of the printed circuit board (PCB) 60 of the top in which the printed circuit board (PCB) 50 and the cell 24 of the bottom in which memory 18 was mounted were mounted is carried out on a screw 70 in four corners, and it is ****ed in the status counter. Moreover, in the center of PCB50 and PCB60, male form connector 80D and female form connector 80U are drooped, respectively, and such connector 80D and connector 80U are made mutual a fitting and connection in the above-mentioned **** status.
[0049] Male form connector 80D drooped on PCB50 is connected to the terminal Vcc of memory 18 through the printed circuit 52 formed on this PCB50. On the other hand, female form connector 80U drooped on PCB60 is connected to the plus electrode of a cell 24, and the line rocker switch 42 of a power circuit 40 through the printed circuit 62 formed on PCB60. Moreover, the above-mentioned cell 24 supports the edge by the base material 90 embedded at PCB60 so that it may not drop out of PCB60. Moreover, although not illustrated especially, AP.ROM20 is also mounted on PCB50.
[0050] In the above configurations, the above-mentioned male form connector 80D and female form connector 80U correspond to the switch 28 shown in drawing 1 . Since it is in the above package status, in order to remove AP.ROM20 from PCB50, after extracting a screw 70 from PCB50 and PCB60, it is necessary to open PCB50. However, if it does in this way and PCB50 is opened, the fitting of male form connector 80D and female form connector 80U will separate, and supply of the supply voltage from the cell 24 or the power circuit 40 to memory 18 will be intercepted. And as a result, all the content of storage of memory 18 is eliminated. And as a result, while the aforementioned system data currently written in memory 18 is eliminated, an initialization ending flag will be reset.
[0051] Therefore, for the purpose of converting unjustly the application program currently written in AP.ROM20, if AP.ROM20 is unfairly taken out from the inside of a device, a device will stop operating normally henceforth. For this reason, it becomes impossible to start the inaccurate application program created without notice by this device.
[0052] In addition, above-mentioned PCB60 may be the up case of a device. Next, drawing 4 is drawing showing other examples of a package of the example shown in above-mentioned drawing 1 and drawing 2 . This drawing (a) Memory 18, AP.ROM20, etc. which are shown in drawing 1 are mounted in the front face of the printed-circuit substrate (PCB) 101 so that it may be shown, and it is drawing 4 (a). The through hole is prepared so that it may be shown in the center. This drawing (b) On the front face of PCB101 around this through hole, and the rear face, ring-like the surface pad (conductor land) 102 and the rear-face pad (conductor land) 103 are formed, respectively so that it may be shown. The path of these pads 102,103 is large rather than the path of the above-mentioned through hole, and these pads 102 and pads 103 are not electrically connected through this through hole. Moreover, this surface pad 103 is electrically connected with the above-mentioned memory 18 by the printed circuit which is not illustrated [which was formed in the surface section of PCB101]. On the other hand, this rear-face pad 102 is electrically connected with the cathode of the diode 30 shown in drawing 1 , and the diode 26 through the printed circuit which is not illustrated [which was formed in the rear face and front face of PCB101], and the non-illustrated through hole.
[0053] The front-face side of above-mentioned PCB101 is covered in the case 120. The bore side of the hollow height 121 of this case 120 serves as the cavity, and the insertion nut 123 which consists of a conductive component is embedded in the cavity. And above-mentioned PCB101 and the above-mentioned

case 120 fix by ****ing the screw 140 which changes from a conductive component to the insertion nut 123 in the hollow height 121 of the above-mentioned case 120 through the through hole of this PCB101. In addition, in this **** status, the spring 125 which consists of a conductive component is ****ed between the surface sections of PCB101 which counters the above-mentioned insertion nut 123 and this. Moreover, in this fixing status, the head of a screw 140 touches the above-mentioned rear-face pad 103 by the rear-face side of PCB101. Therefore, in the status that PCB101 and the case 120 fixed with the screw 140 and the insertion nut 123 in this way, since the rear-face pad 102 and the surface pad 103 are electrically connected through a screw 140, the insertion nut 123, and the spring 125, it is backed up by the cell 24 while supply voltage is supplied to memory 18 from a power circuit 140.

[0054] In the above-mentioned configuration, a pad 102,103, the insertion nut 121, the spring 125, and the screw 140 correspond to the switch 28 shown in drawing 1 . As mentioned above, since AP.ROM20 is mounted in the surface section side of PCB101, in order to remove AP.ROM20 from PCB101, it needs to remove a screw 140. However, if a screw 140 is removed, since the rear-face pad 102 and the surface pad 103 which had been conducted through this screw 140 will be in non-continuity, supply of the supply voltage from the power circuit 40 and the cell 24 to memory 18 will be intercepted, and all the content of storage of memory 18 will be eliminated.

[0055] Thus, also in the example of a package shown in drawing 4 , if this AP.ROM20 is removed from PCB101 for the unjust purpose of exchanging AP.ROM20 for other AP.ROMs, this electronic equipment will never stop operating.

[0056] Next, drawing 5 is drawing showing the example of a package of further others of the example of a configuration of being shown in above-mentioned drawing 1 and drawing 2 . At this example, it is drawing 5 (a). IC socket 220 for AP.ROM21 insertion is inserted in a part of PCB210 in which the electronic parts of each block shown in drawing 1 so that it may be shown were mounted. Moreover, the microswitch 230 which corresponds to the switch 28 of drawing 1 inside this IC socket 220 is ****ed. The height of the push button 231 of this microswitch 230 is set as a height which this microswitch 230 is pushed and is turned on, when AP.ROM21 is inserted in this IC socket 220.

[0057] Therefore, since the switch 28 shown in drawing 1 at the time of factory shipments is switched on, a predetermined constant voltage is supplied from the cell 24 whose memory 18 mounted in PCB210 is a backup power supply. For this reason, while the system data written in memory 18 is held, an initialization ending flag is also held at the set status.

[0058] And for the inaccurate purpose of a certain purchaser exchanging AP.ROM20 for other AP.ROMs unfairly after factory shipments, if the AP.ROM20 is ****ed from IC socket 220, a microswitch 230 will become off and supply of the supply voltage to the memory 18 from the power circuit 40 and the cell 24 will be intercepted. And as this result, since all the content of storage of memory 18 is eliminated, a system data is also eliminated and an initialization ending flag is also reset.

[0059] Therefore, the same effect as the example shown in drawing 3 and drawing 4 which were mentioned above is acquired. Next, as shown in drawing 6 , the example of a package in case the power which supplies supply voltage to memory 18 in the circuit shown in drawing 1 consists only of a cell 24 is shown in drawing 7 .

[0060] in this drawing, the printed circuit board (PCB) 250 in which memory 18 was mounted, and other printed circuit boards (PCB) 260 carry out the screw setting of each four corners on a screw 270 — having — a predetermined spacing — it is fixed mutually, separating

[0061] In this fixed status, the elastic component 280 is ****ed on this PCB250, and the cell 24 is ****ed between this elastic component 280 and above-mentioned PCB260. Moreover, the wiring component which is not illustrated [which fixed on the front face of the printed circuit 252 formed on PCB250 and the elastic component 280] connects electrically, and the memory 18 mounted in PCB250 and the above-mentioned cell 24 back up memory 18 from a cell 24 by it. Moreover, although not illustrated especially, AP.ROM20 is also mounted on PCB250. For this reason, in order to take out AP.ROM20, it has the structure where any of PCB250 and PCB260 by which screw setting is carried out on the screw 270, or one side must be opened. In the above configurations, the contact section with the wiring component which is not illustrated [which fixed in the plus terminal and the above-mentioned elastic component 280 of a cell 24] corresponds to the switch 28 of drawing 1 .

[0062] And if someone removes a screw 270 and opens PCB260 or PCB250 for the inaccurate purpose of exchanging AP.ROM20 for another AP.ROM unfairly when it is in the status which shows in drawing 4 , the cell 24 which had appeared in the unstable status on the elastic component 280 will be omitted from on the elastic component 280, and supply of the supply voltage to memory 18 will stop from this cell 24. While the above-mentioned system data memorized by memory 18 is eliminated by this, an initialization setting flag is reset. Consequently, it becomes impossible to perform the application program currently again written in AP.ROM20 by this system though returned to the status which shows in drawing 7 again like the example shown in above-mentioned drawing 3 or drawing 5 . Moreover, execution of the application program written in AP.ROM for which it was exchanged unfairly also becomes impossible.

[0063] In addition, if the component which has conductivity as the above-mentioned elastic component 280 is used, the above-mentioned wiring component will become unnecessary. Next, or drawing 8 tends to decode unjustly the program currently written in AP.ROM20, it is drawing showing the example of a package of the electronic equipment which prevents the unjust action of the AP.ROM20 being unfairly exchanged for other AP.ROMs, and operating electronic equipment by another application program.

[0064] In this drawing, like the example shown in drawing 7 mentioned above, screw setting is carried out on a screw 330, only the distance of a predetermined spacing separates each four corners mutually, and two PCB310 and PCB320 are being fixed.
[0065] above-mentioned PCB310 top -- EPROM (Erasable and Programmable Read OnlyMemory) **** -- AP.ROM20 which changes is mounted Moreover, when the power of about 15 W is supplied on this AP.ROM20, the stroboscopic tube 340 for eliminating the stored data of above-mentioned AP.ROM20 to which wavelength irradiates the ultraviolet rays of about 2357 ** for about 0.96 seconds carries and fixes. Furthermore, between above-mentioned PCB310 and above-mentioned PCB320, ** arrival of the insulating component 350 which the end fixed in above-mentioned PCB320 is carried out, and the nose of cam of the 1st conductive component 360 which has the rigidity which the part fixed on PCB310, and the 2nd conductive component 370 is this **ing on both sides of this insulating component 350. The nose of cam of these conductive components 360,370 is bent in the shape of a semicircle so that it may have elasticity. Therefore, if the above-mentioned insulating component 350 is removed, the nose of cam of the two above-mentioned conductive components 360 and 370 will contact mutually. That is, the three above-mentioned components 350,360,370 constitute one pilot switch.
[0066] The other end of the above-mentioned conductive component 360 is connected with the power input terminal of the above-mentioned stroboscopic tube 340, and the other end of another conductive component 370 is connected to the non-illustrated cell through the printed circuit formed on PCB310.
[0067] Thus, since AP.ROM20 is ****ed between PCB310 and PCB320, in order to take out AP.ROM20, it needs to remove a screw 330 and needs to open PCB320. However, since the insulating component 350 will also be drawn out with PCB320 if such action is performed, each nose of cam of the conductive component 360 and the conductive component 370 contacts for the above grounds, and the drive power of about 15 W is supplied to the stroboscopic tube 340 from the aforementioned cell. All the content by which the ultraviolet rays of about 2357 ** were irradiated by the ultraviolet-rays transparency aperture of AP.ROM20 which consists of the stroboscopic tube 340 to EPROM for about 0.96 seconds, and wavelength was written by this in it at AP.ROM20, i.e., the content of an application program, is eliminated. Therefore, decode of the application program written in AP.ROM20 of the shipped electronic equipment becomes impossible.
[0068] In addition, in this example, although EPROM is used for AP.ROM20, you may use EEPROM (Electrically Erasable Programmable ROM) instead of EPROM. In this case, the switch which detects what above-mentioned PCB320 was able to open, for example is formed, and it considers as a configuration whose microprocessor the signal from this pilot switch is received and eliminates the content of storage of the above-mentioned EEPROM.
[0069] Moreover, as a modification of the example shown in aforementioned drawing 5 , ICs other than AP.ROM20 (for example, memory 18) are inserted in above-mentioned IC socket 220, and it may be made to eliminate all the content of storage of AP.ROM20 which consists of eliminable ROM of EPROM or EEPROM by the detecting signal of the microswitch 230 at the time of the IC being sampled from IC socket 220. When it considered as such a configuration, above-mentioned IC socket 220 was equipped with memory 18 and the unjust action is performed to the electronic equipment after shipment, the deletion not only of the content of AP.ROM20 but the content of memory 18 is attained simultaneously.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[An easy explanation of a drawing]
[Drawing 1] It is the circuit block diagram showing the system configuration of the electronic equipment of one example of this invention.
[Drawing 2] It is a flow chart explaining an operation of CPU in the above-mentioned example.
[Drawing 3] It is drawing showing the 1st example of a package of the above-mentioned example.
[Drawing 4] It is drawing showing the 2nd example of a package of the above-mentioned example.
[Drawing 5] It is drawing showing the 3rd example of a package of the above-mentioned example.
[Drawing 6] The power for memory is drawing showing the example of a circuit which consists only of a cell.
[Drawing 7] It is drawing showing the example of a package of the above-mentioned memory and the above-mentioned cell when being the configuration which the power circuit for memory shows to drawing 7 .
[Drawing 8] It is drawing showing the example of a package at the time of using EPROM as an AP.ROM.
[An explanation of a sign]
10 Circuit of Electronic Equipment
12 CPU
14 OS.ROM
16 IP.ROM
18 Memory
20 AP.ROM
22 I/O Controller
24 Cell 28 Switch
40 Power Circuit
42 Line Rocker Switch
50, 60, 101, 210, 250,260,310,320 Printed circuit board (PCB)
70,140,270,330 Screw
80D Male connector
80U Jack
90 Base Material
102 Rear-Face Pad
103 Surface Pad
120 Case
121 Height of Case
123 Insertion Nut
125 Spring
220 IC Socket
230 Microswitch
252 Printed Circuit
280 Elastic Component
340 Stroboscopic Tube
350 Insulating Component
360 1st Conductive Component
370 2nd Conductive Component

[Translation done.]

* NOTICES *

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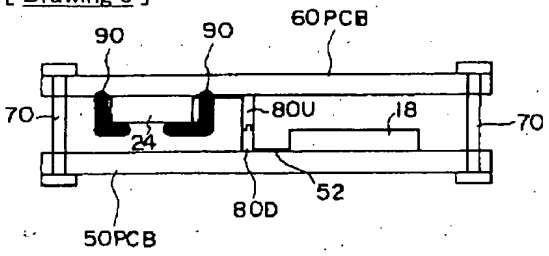
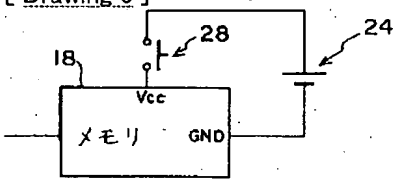
3.In the drawings, any words are not translated.

DRAWINGS

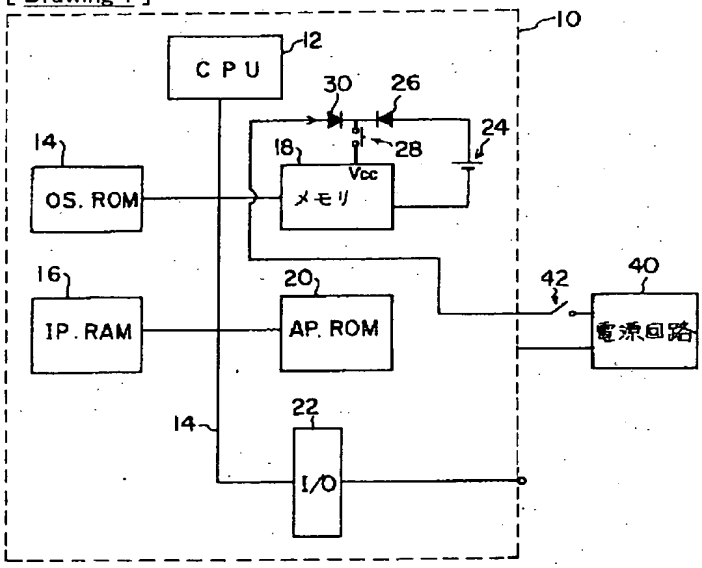
[Drawing 3]



[Drawing 6]

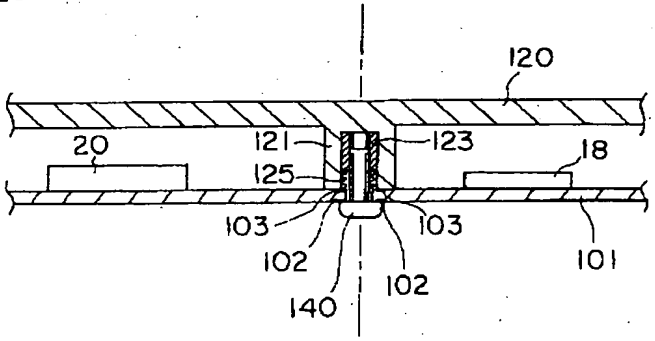


[Drawing 1]

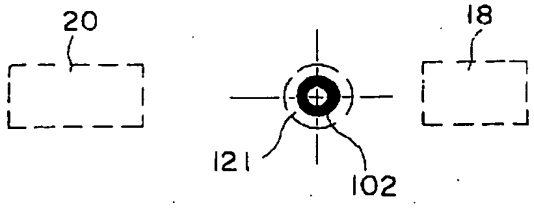


[Drawing 4]

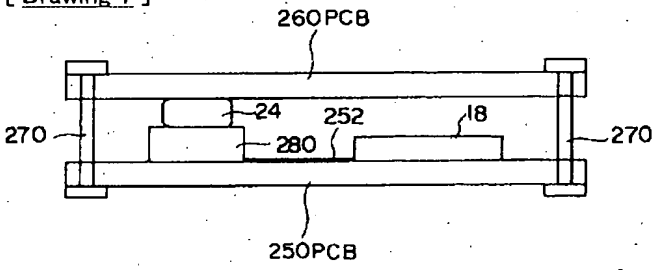
(a)



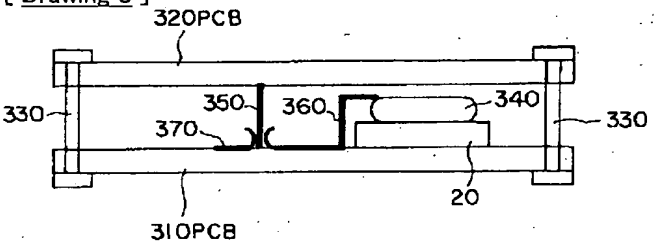
(b)



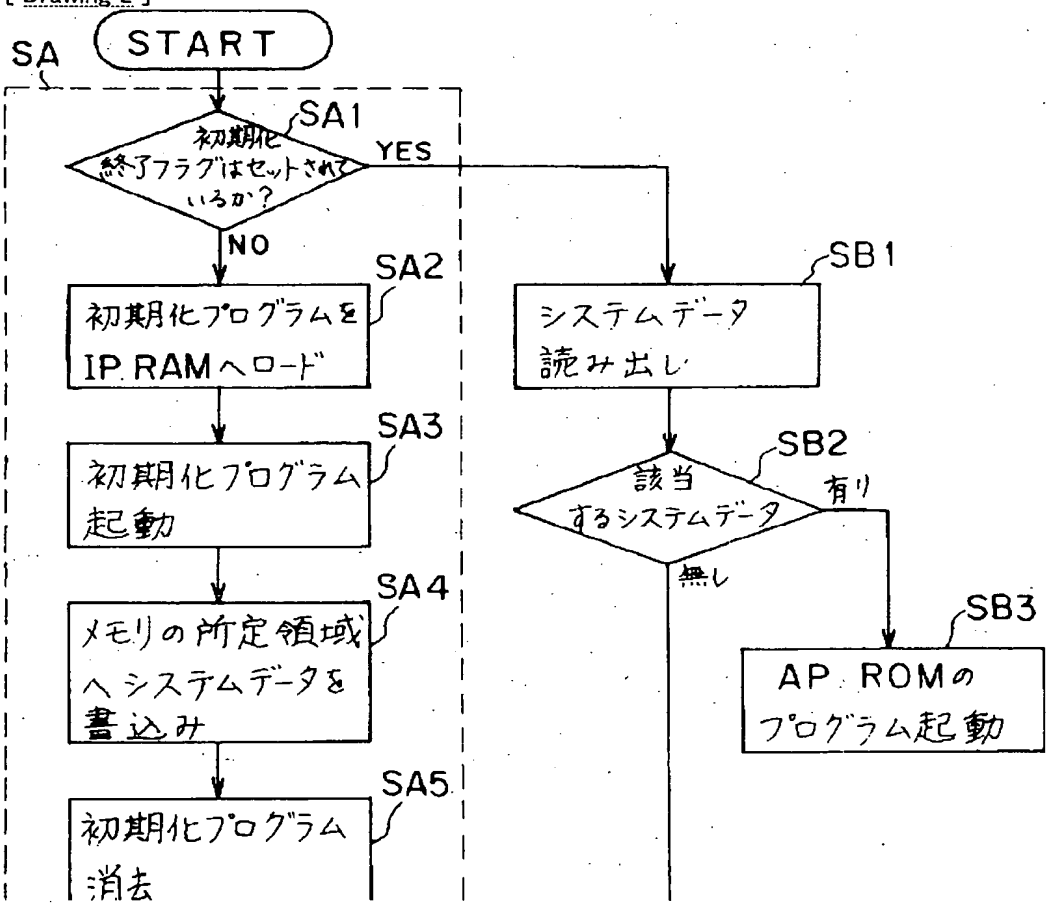
[Drawing 7]

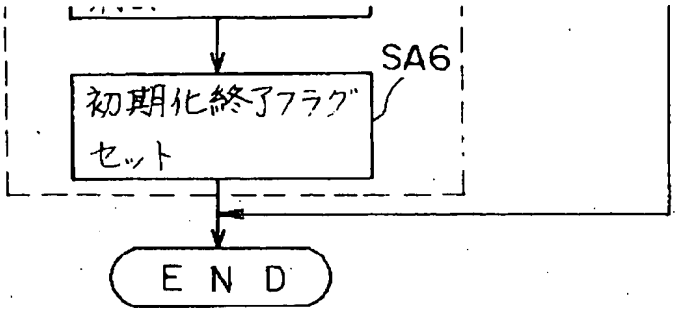


[Drawing 8]

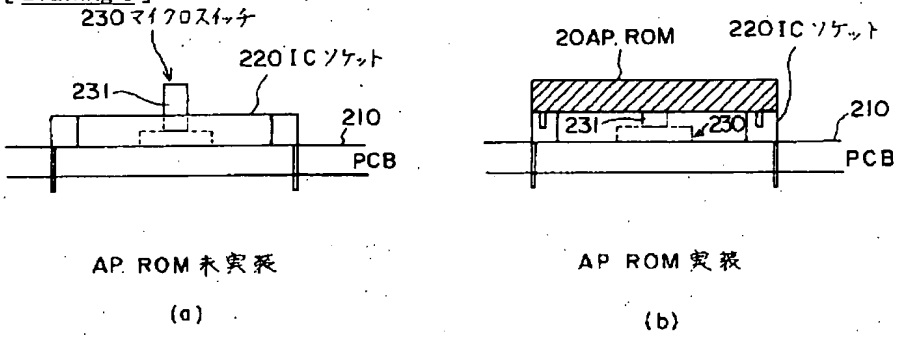


[Drawing 2]





[Drawing 5]



AP. ROM 未実装

(a)

AP ROM 実装

(b)

[Translation done.]

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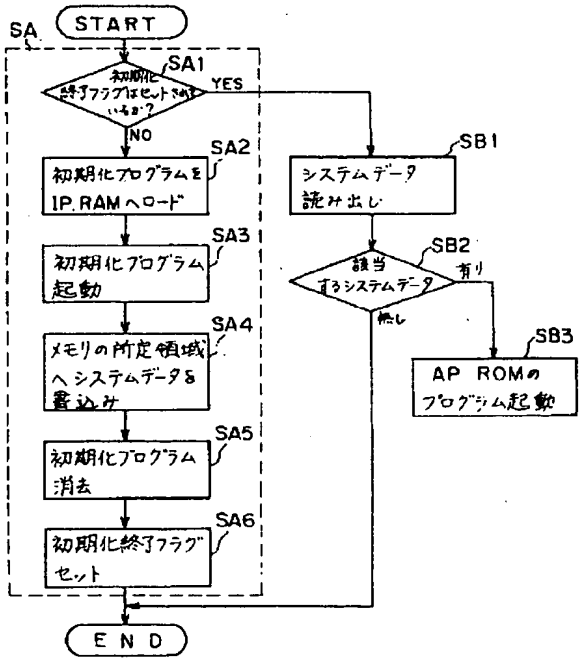
最終頁に続く

(54)【発明の名称】　起動プログラム保護方法

(57)【要約】

【目的】　プログラム制御の機器を正規のプログラム以外では動作させないようにする。

【構成】　ある電子機器に対し製品出荷前に、以下の処理を事前に行う。すなわち、外部から初期化プログラムをＩＰ．ＲＡＭへロードし（ＳＡ２）、この初期化プログラムの起動・実行により、揮発性のメモリの所定領域に予め定められたシステムデータを書き込む（ＳＡ３，ＳＡ４）。そして、このデータ書き込み終了後、上記初期化プログラムを消去し（ＳＡ５）、上記メモリの所定アドレスに初期化終了フラグをセットする（ＳＡ６）。上記電子機器は製品出荷後には、初期化終了フラグがセットされているのを確認した後（ＳＡ１，ＹＥＳ）、上記メモリに上記システムデータが書き込まれているか否か調べ（ＳＢ１，ＳＢ２）、上記システムデータが無ければ（ＳＢ２，ＮＯ）、ＡＰ．ＲＯＭに格納されているプログラムの実行は行わず直ちに終了する。



1

【特許請求の範囲】

【請求項１】　予め定められたデータをメモリに書き込んでおき、所定のプログラムの起動に際して、前記メモリに前記データが記憶されているか否かを検出し、そのデータが記憶されていないことが検出された際には、前記所定のプログラムの起動を行わないようにしたことを特徴とする起動プログラム保護方法。

【請求項２】　前記データの書込みは、外部からロードしたプログラムの実行により行われ、このプログラムは実行終了後、消去されることを特徴とする請求項１記載の起動プログラム保護方法。

【請求項３】　前記メモリは揮発性のメモリよりなり、少なくともこのメモリが実装された部品担持体及びこのメモリに電源電圧を供給する電源を有し、この電源からの前記メモリへの電源供給路を前記部品担持体と基板との間に設け、前記部品担持体と前記基板との間隔が開かれた際に、前記電源供給路が遮断されることを特徴とする請求項１記載の起動プログラム保護方法。

【請求項４】　前記メモリは揮発性のメモリよりなり、前記メモリに電源電圧を供給する電源を有し、プログラムなどが記憶される電子部品と該電子部品が実装される基板との間にスイッチを設け、前記電子部品が前記基板から外された際に、前記スイッチの状態変化により前記メモリに対する電源の供給を遮断することを特徴とする請求項１記載の起動プログラム保護方法。

【請求項５】　前記メモリは揮発性のメモリよりなり、少なくともこのメモリが実装された基板及びこのメモリに電源を供給する電池を有し、この電池を前記基板とこの基板を覆う基体との間で挟持し、前記基板と前記基体との間隔が開かれた際に、前記電池が脱落することを特徴とする請求項１記載の起動プログラム保護方法。

【請求項６】　プログラムもしくはデータを記憶する消去可能なＲＯＭ及びこの消去可能なＲＯＭの記憶内容を消去する消去装置が実装された部品担持体を有し、この部品担持体を覆う基体と前記部品担持体との間隔が開かれた際に、これを検出する検出スイッチを設け、この検出スイッチの状態変化に応答して前記消去装置を駆動して前記消去可能なＲＯＭの記憶内容を消去することを特徴とする起動プログラム保護方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、所定のプログラムを起動する方法に係り、特に該プログラムを不当な交換や不正な改造・解読等から保護する起動プログラム保護方法に関する。

【０００２】

【従来の技術】最近の電子機器や産業機器は、インテリジェント化が目覚ましくマイクロコンピュータを組み込んだものが多くなってきている。このようなマイクロコンピュータ組み込み機器においては、プログラム制御により多機能化や機能の個別化が可能である。

2

【０００３】このため、機器に組み込まれたマイクロコンピュータのＲＯＭ（リード・オンリ・メモリ）に書き込まれているプログラムの内容は各企業にとって重要な機密事項となっており、特にそのプログラムが重要な機能を果たすものでは、プログムを不法に他の企業に解読されたり、コピーされることはその製品の信頼性が弱まることとなる。

【０００４】また、プログラムが書き込まれたＲＯＭを不当に差し換えられて、一部の機能を追加させられたり機能変更を図られることも企業にとって大きな痛手である。

【０００５】

【発明が解決しようとする課題】しかしながら、従来、上記のよなマイクロコンピュータが組み込まれた機器においては、ＲＯＭに書き込まれたプログラム（例えば、アプリケーション・プログラム）の不法な解読やコピーに対して十分な保護対策が施されていないのが実情である。また、プログラムが書き込まれたＲＯＭの不当な差し換えに対しても十分な保護が施されていない。

【０００６】本発明は、上記のような実情に鑑み、機器に本来組み込まれるべき正規のプログラムでなければその機器を動作させないようにする、すなわち換言すれば、無断で作成された不正のプログラムをその機器で起動できなくなるようにすることを目的とする。

【０００７】さらに、機器を不法に改造しようとしてプログラムの書き込まれたＲＯＭを取り出そうとした場合に、以後、その機器が正常に動作しないようにすることを他の目的とする。

【０００８】また、機器に実装されているＲＯＭに書き込まれたプログラムの解読を禁止して、不正なプログラム（ソフト）の作成を防止することを、さらに他の目的とする。

【０００９】

【課題を解決するための手段】請求項１記載の発明は、予め定められたデータをメモリに書き込んでおき、所定のプログラムの起動に際して、前記メモリに前記データが記憶されているか否かを検出し、そのデータが記憶されていないことが検出された際には、前記所定のプログラムの起動を行わないようにしたことを特徴とする。

【００１０】上記所定のプログラムは、例えば、ある電子機器に予め組み込まれているプログラムである。請求項２記載の発明は、上記請求項１記載の発明において、前記データの書込みは、外部からロードしたプログラムの実行により行われ、このプログラムは実行終了後、消去されることを特徴とする。

【００１１】上記プログラムのロードは、例えば、フロッピーディスク装置やハードディスク装置等の外部記憶装置から行われる。請求項３記載の発明は、上記請求項１記載の発明において、前記メモリは揮発性のメモリよ

りなり、少なくともこのメモリが実装された部品担持体及びこのメモリに電源電圧を供給する電源を有し、この電源からの前記メモリへの電源供給路を前記部品担持体と基板との間に設け、前記部品担持体と前記基板との間隔が開かれた際に、前記電源供給路が遮断されることを特徴とする。

【００１２】上記電源供給路は、例えば接続コネクタまたはビス等を含む。また、上記部品担持体は、例えばプリント回路基板であってもよい。請求項４記載の発明は、上記請求項１記載の発明において、前記メモリは揮発性のメモリよりなり、前記メモリに電源電圧を供給する電源を有し、プログラムなどが記憶される電子部品と該電子部品が実装される基板の間にスイッチを設け、前記電子部品が前記基板から外された際に、前記スイッチの状態変化により前記メモリに対する電源の供給を遮断することを特徴とする。

【００１３】上記電子部品は、例えば、電子機器組み込み用のアプリケーション・プログラムが書き込まれているＲＯＭ（Read Only Memory）である。請求項５記載の発明は、上記請求項１記載の発明において、前記メモリは揮発性のメモリよりなり、少なくともこのメモリが実装された基板及びこのメモリに電源を供給する電池を有し、この電池を前記基板と前記基板を覆う基体との間で挟持し、前記基板と前記基体との間隔が開かれた際に、前記電池が脱落することを特徴とする。

【００１４】上記基体は、例えばプリント回路基板であってもよい。請求項６記載の発明は、プログラムもしくはデータを記憶する消去可能なＲＯＭ及びこの消去可能なＲＯＭの記憶内容を消去する消去装置が実装された部品担持体を有し、この部品担持体を覆う基体と前記部品担持体との間隔が開かれた際に、これを検出する検出スイッチを設け、この検出スイッチの状態変化に応答して前記消去装置を駆動して前記消去可能なＲＯＭの記憶内容を消去することを特徴とする。

【００１５】上記消去可能なＲＯＭは、例えば紫外線消去型のＥＰＲＯＭ（Erasable Pro-grammable ROM）から成り、この場合、上記消去装置は紫外線を照射するストロボ放電管等の紫外線照射装置から成る。また、上記検出スイッチは、例えば、マイクロスイッチから成る。また、上記消去可能なＲＯＭは、例えばＥＥＰＲＯＭ（Electrically Erasable Programmable ROM）であってもよい。

【００１６】

【作用】上記請求項１記載の発明においては、予め定められたデータをメモリ（以後、便宜上、データメモリと表現する）に書き込んでおく。そして、所定のプログラムを起動する際には、前記データメモリに前記データが記憶されているか否かを検出し、そのデータが記憶されていなければ前記所定のプログラムの起動は行わない。

【００１７】したがって、例えばマイクロコンピュータ制御（以後、マイコン制御と表現する）の電子機器に組み込まれている上記マイコン制御用の所定のプログラムを解読または改造、さらには別のプログラムに交換するなどの不正な目的で、上記所定のプログラムが書き込まれているメモリ（以後、便宜上プログラム・メモリと表現する）を、上記電子機器内の基板から取り外そうとしたとき、上記データメモリ内に記憶されている前記データが消去されるようにすれば、上記のような不正な行為を行った場合、以後、上記電子機器を正常に動作しないようにすることができる。換言すれば、上記電子機器を正規のプログラム以外では動作させないようにすることができる。

【００１８】また、請求項２記載の発明においては、上記メモリへの上記予め定められたデータの書き込みを、外部からロードされるプログラムの実行により行い、該プログラムはその実行終了後、直ちに消去する。

【００１９】したがって、工場出荷時に上記のようなデータ書き込み処理を行うことにより、製品出荷後に、第三者が上記メモリへ上記予め定められたデータを書き込むことはほとんど不可能となる。このため、上述したように、機器を不当に改造するために、上記所定のプログラムが書き込まれたメモリを基板から取り外す行為をした場合に上記データが消去されるようにすることにより、上記のような不正な行為を行った場合には、以後、その機器が正常に動作しないようにすることができる。

【００２０】また、請求項３記載の発明においては、前記データメモリとして揮発性のメモリを用い、少なくともこのデータメモリが実装された部品担持体及びこのデータメモリに電源電圧を供給する電源を設け、さらに、この電源からの前記データメモリへの電源供給路を前記部品担持体と基板との間に設ける。そして、前記部品担持体と前記基板との間隔が開かれた際に、前記電源供給路を遮断する。このため、データメモリへの電源電圧の供給は途絶えるので、そのデータメモリに記憶されていた前記データは消去される。

【００２１】したがって、前記基板上に前記プログラム・メモリを実装し、その基板からそのプログラム・メモリを取り出す際には、必ず前記部品担持体と前記基板との間隔が開いて前記電源供給路が遮断されるような構成にすることにより、上記請求項１記載の発明と同様な効果が得られる。

【００２２】請求項４記載の発明においては、前記データメモリとして揮発性のメモリを用い、前記データメモリに電源電圧を供給する電源を設け、さらにプログラムなどが記憶される電子部品と該電子部品が実装される基板との間にスイッチを設ける。そして、前記電子部品が前記基板から取り外された際に、前記スイッチの状態変化により前記メモリに対する電源電圧の供給を遮断させる。これにより、前記データメモリに記憶されていた前記データは消去される。

5

【００２３】したがって、例えば、上記電子部品を上記プログラム・メモリとすることにより、上記所定のプログラムを不法に改造、交換または解読しようとして、上記プログラム・メモリを上記基板から取り外す行為を行うと、上述の理由によりそのプログラム・メモリが実装されている電子機器は、以後、正常に動作しなくなる。

【００２４】請求項５記載の発明においては、前記データメモリとして揮発性のメモリを用い、少なくともこのデータメモリが実装された基板及びこのデータメモリに電源電圧を供給する電池を設け、この電池が前記基板と基体との間で挟持される構成とする。このため、前記基板と前記基体との間隔が開かれると、前記電池が脱落し、これにより、前記データメモリに記憶されていた前記データが消去される。

【００２５】したがって、前記基板上に前記プログラム・メモリを実装し、そのプログラム・メモリをその基板から取り外そうとするとき、必ず、その基板と前記基体との間隔が開くような構成とすることにより、上記請求項１記載の発明と同様な効果が得られる。

【００２６】請求項６記載の発明においては、プログラムもしくはデータを記憶する消去可能なＲＯＭ及びこの消去可能なＲＯＭの記憶内容を消去する消去装置が実装された部品担持体を設け、さらにこの部品担持体を覆う基体と前記部品担持体との間隔が開かれた際に、これを検出する検出スイッチを設ける。そして、この検出スイッチの状態変化に応答して前記消去装置を駆動して前記消去可能なＲＯＭの記憶内容を消去する。

【００２７】したがって、上記消去可能なＲＯＭにマイコン制御の電子機器に組み込まれるプログラムを格納するようにすれば、そのプログラムを解読しようとして上記基体を開けようとすると、上記検出スイッチが作動し、上記消去装置により上記ＲＯＭに書き込まれていた上記プログラムが消去される。そして、これにより上記プログラムの解読は不可能となる。

【００２８】

【実施例】以下、図面を参照しながら本発明の実施例を説明する。図１は、本発明の一実施例である電子機器のシステム構成を示す回路ブロック図である。

【００２９】同図において、破線で囲まれた回路１０は１または複数のプリント回路基板上等に実装される。該回路１０は、ＣＰＵ１２、該ＣＰＵ１２とバス１４で接続されたＯＳ．ＲＯＭ１６、ＩＰ．ＲＡＭ１８、メモリ１８、ＡＰ．ＲＯＭ２０、及びＩ／Ｏコントローラ２２を備えている。

【００３０】ＯＳ．ＲＯＭ１６は、例えばマスクＲＯＭ(mask Read Only Memory)等のようなＲＯＭ（リード・オンリ・メモリ）から成り、ＣＰＵ１２により実行されるオペレーティング・システム（ＯＳ）が格納されている。

【００３１】ＩＰ．ＲＡＭ１６は、Ｉ／Ｏコントローラ２２を介して入力される初期化プログラムを格納するＲＡＭ（ランダム・アクセス・メモリ）である。メモリ１８は、揮発性のメモリであり、通常はメイン電源である外部の電源回路４０から電源電圧を供給される。そして、該電源回路４０のスイッチ４２がオフとなって電源回路４０からの電源電圧の供給が途絶えたときにはバックアップ電源である例えば二次電池から成る電池２４から電源電圧の供給を受けることによりデータを保持する。該電池２４のプラス電極はダイオード２６のアノードに接続されており、上記電池２４からの電源電圧はこのダイオード２６及びスイッチ２８を介してメモリ１８に供給される。一方、電源回路４０からの電源電圧は電源スイッチ４２、別のダイオード３０及び上記スイッチ２８を介してメモリ１８に供給される。

【００３２】ＡＰ．ＲＯＭ２０は、所定のアプリケーション・プログラムが書き込まれたＲＯＭであり、紫外線の照射によりデータの一括消去が可能で、データの再書き込みも可能なＥＰＲＯＭ（Erasable and Programmable Read Only Memory）となっている。

【００３３】Ｉ／Ｏコントローラ２２は、ＣＰＵ１２とフロッピーディスク装置やハードディスク装置等の外部記憶装置やその他の周辺装置との間のデータの入出力を制御する。

【００３４】電源回路４０は、例えばスイッチング電源（Switing Power Supply）等から成る直流安定化電源であり、上記メモリ１８以外に、ＣＰＵ１２、ＯＳ．ＲＯＭ１４、ＩＰ．ＲＡＭ１６、ＡＰ．ＲＯＭ２０及びＩ／Ｏコントローラ２２に直流電源電圧を供給している。

【００３５】次に、上記構成の電子機器の動作を図２のフローチャートを参照しながら説明する。まず、この電子機器は出荷前に同図において破線で囲んで示すＳＡの処理を行う。

【００３６】この処理ＳＡは、ＡＰ．ＲＯＭ２０の不当交換を防止するためのシステムの初期化処理である。まず、電源スイッチ４２がオンに設定されると、ＣＰＵ１２はＯＳ．ＲＯＭ１４に格納されているＯＳ（オペレーティング・システム）を実行し、まずメモリ１８の予め定められた所定アドレスを参照して初期化終了フラグがセットされているか否か判別する（ＳＡ１）。この初期化終了フラグは、例えば１ビットのフラグである。

【００３７】この段階では、まだ初期化終了フラグはセットされていないので（ＳＡ１，ＮＯ）、次に不図示の外部の記憶装置からＩ／Ｏコントローラ２２を介して初期化プログラムをＩＰ．ＲＡＭ１６にロードする（ＳＡ２）。

【００３８】ＣＰＵ１２は、続いてこの初期化プログラムを起動し（ＳＡ３）、この初期化プログラムの実行により、メモリ１８の所定領域へ予め定められたシステムデータを書き込む（ＳＡ４）。このシステムデータは、例えば数ワードの所定の文字列である。

【００３９】続いて、ＩＰ．ＲＡＭ１６上にロードされている前記初期化プログラムを消去し（ＳＡ５）、次にメモリ１８の所定アドレスの上記初期化終了フラグをセットする（ＳＡ６）。

【００４０】以上のようなシステムの初期化処理ＳＡにより、上記電子機器は工場から出荷される際に初期化終了フラグがセットされていると共に、メモリ１８の所定領域に上記システムデータが書き込まれている。尚、工場出荷時には電池２４が実装され、またスイッチ２８もオンに設定されてメモリ１８はバックアップされるので該メモリ１８の所定領域に書き込まれたシステムデータ及び初期化終了フラグの状態は保持される。

【００４１】次に、工場出荷後にユーザによって使用されるときの上記電子機器の動作を同じく図３のフローチャートを参照しながら説明する。ユーザが上記電子機器を使用するために電源スイッチ４２をオンにすると、電源回路４０から図１の破線で囲まれた回路１０の全ての電子部品に電源電圧が供給され、ＣＰＵ１２はＯＳ．ＲＯＭ１４に格納されているオペレーティングシステムを実行する。これにより、ＣＰＵ１２はまず、メモリ１８上の所定アドレスの初期化終了フラグを参照し、この初期化終了フラグがセットされているか否か判別する（ＳＡ１）。

【００４２】そして、初期化フラグがセットされていれば（ＳＡ１，ＹＥＳ）、メモリ１８のシステムデータの書き込み領域からデータを読み出し（ＳＢ１）、このデータが前記処理ＳＡにより書き込まれたシステムデータと同一であるか否か調べることにより、メモリ１８上にシステムデータが有るか否か調べる（ＳＢ２）。

【００４３】そして、上記該当システムデータが有れば、ＡＰ．ＲＯＭ２０からアプリケーション・プログラムを読み出し、該アプリケーション・プログラムを起動する（ＳＢ３）。

【００４４】このように、メモリ１８に初期化終了フラグがセットされておりかつ該当システムデータが書き込まれてあるときにのみＡＰ・ＲＯＭ２０に格納されているアプリケーション・プログラムを実行する。

【００４５】一方、上記ステップＳＢ２で該当するシステムデータが無かった場合には、上記アプリケーション・プログラムの実行は行わず、直ちに処理を終了する。本実施例においては、後述するように工場出荷後に、上記アプリケーション・プログラムを解読または改造するなどの不正な目的で上記ＡＰ．ＲＯＭ２０をプリント回路基板から取り外すような不当な行為を行った場合、メモリ１８の内容すなわち前記システムデータが消去されるような仕組みとなっている。

【００４６】したがって、上記のような不当な行為が行われた場合、ＡＰ．ＲＯＭ２０に格納されているアプリケーション・プログラムを起動できなくなる。また、本実施例においては初期化フラグとシステムデータの二重チェックを行っているため、上記のような不当な行為が厳重に禁止される。また、これは、上記初期化終了フラグをビットフラグとした場合、上記のような不当な行為を行った後、偶然（人的行為またはα線によるソフトエラー等）または故意に上記初期化フラグがセットされてしまう事態もありえるため、このための対策でもある。

【００４７】また、さらに安全性を期するために、上述したように工場出荷前において、上記初期化プログラムを実行して該初期化終了フラグをセットし終わった後、直ちに上記初期化プログラムを消去して、この電子機器の購入者が、この初期化プログラムを使用できないような対策を施している（図２のフローチャートのＳＡ５）。

【００４８】次に、上記図１及び図２に示す構成の実施例の実装例を図３乃至図５に示す。図３は本実施例の実装形態の一例を示す側面図である。同図において、メモリ１８が実装された下側のプリント回路基板（ＰＣＢ）５０と電池２４が実装された上側のプリント回路基板（ＰＣＢ）６０とが、四隅をビス７０によりビス止めされて、対向する状態で固設されている。また、ＰＣＢ５０とＰＣＢ６０の中央には、それぞれ雄形コネクタ８０Ｄと雌形コネクタ８０Ｕが垂設されており、上記固設状態においてこれらのコネクタ８０Ｄとコネクタ８０Ｕは互いに嵌合・接続されている。

【００４９】ＰＣＢ５０上に垂設された雄形コネクタ８０Ｄは、該ＰＣＢ５０上に形成されたプリント配線５２を介してメモリ１８の端子Ｖｃｃに接続されている。一方、ＰＣＢ６０上に垂設された雌形コネクタ８０ＵはＰＣＢ６０上に形成されたプリント配線６２を介して電池２４のプラス電極及び電源回路４０の電源スイッチ４２に接続されている。また、上記電池２４はＰＣＢ６０から脱落しないように、その端部をＰＣＢ６０に埋め込まれた支持体９０によって支えられている。また、特に図示してはいないがＰＣＢ５０上にはＡＰ．ＲＯＭ２０も実装されている。

【００５０】以上のような構成において、上記雄形コネクタ８０Ｄと雌形コネクタ８０Ｕが図１に示すスイッチ２８に該当している。上記のような実装状態になっているため、ＰＣＢ５０からＡＰ．ＲＯＭ２０を取り外すためには、ビス７０をＰＣＢ５０及びＰＣＢ６０から抜いた後、ＰＣＢ５０を開ける必要がある。しかしながら、このようにしてＰＣＢ５０を開けると雄形コネクタ８０Ｄと雌形コネクタ８０Ｕの嵌合が外れメモリ１８への電池２４または電源回路４０からの電源電圧の供給が遮断される。そして、この結果、メモリ１８の記憶内容は全て消去される。そして、この結果、メモリ１８に書き込まれていた前記システムデータが消去されると共に初期化終了フラグがリセットされてしまう。

【００５１】したがって、ＡＰ．ＲＯＭ２０に書き込まれているアプリケーション・プログラムを不正に改造す

るなどの目的で、不当にＡＰ．ＲＯＭ２０を機器内から取り出すと、以後、機器が正常に動作しなくなる。このため、この機器で無断で作成された不正のアプリケーション・プログラムを起動することは不可能になる。

【００５２】尚、上記ＰＣＢ６０は、例えば機器の上部ケースであってもよい。次に、図４は上記図１及び図２に示す実施例の他の実装例を示す図である。同図(a)に示すようにプリント配線基板（ＰＣＢ）１０１の表面には、図１に示すメモリ１８、ＡＰ．ＲＯＭ２０等が実装されており、また図４(a)中央に示すようにスルーホールが設けられている。同図(b)に示すように、該スルーホールの周囲のＰＣＢ１０１の表面及び裏面上には、それぞれリング状の表面パッド（導体ランド）１０２及び裏面パッド（導体ランド）１０３が形成されている。これらのパッド１０２，１０３の径は上記スルーホールの径よりも大きくなっており、これらのパッド１０２とパッド１０３は該スルーホールを介して電気的に接続されてはいない。また、該表面パッド１０３はＰＣＢ１０１の表面部に形成された不図示のプリント配線により上記メモリ１８と電気的に接続されている。一方、該裏面パッド１０２は、ＰＣＢ１０１の裏面並びに表面に形成された不図示のプリント配線及び不図示のスルーホールを介し、図１に示すダイオード３０及びダイオード２６のカソードと電気的に接続されている。

【００５３】上記ＰＣＢ１０１の表面側はケース１２０により覆われている。該ケース１２０の中空突起部１２１の内径側は空洞となっており、その空洞には導電性部材から成るインサートナット１２３が埋め込まれている。そして、上記ＰＣＢ１０１と上記ケース１２０は、該ＰＣＢ１０１のスルーホールを介して上記ケース１２０の中空突起部１２１内のインサートナット１２３に導電性部材から成るビス１４０を螺合することにより、固着されている。尚、この螺合状態において、上記インサートナット１２３とこれに対向するＰＣＢ１０１の表面部との間には、導電性部材から成るスプリング１２５が介装されている。また、この固着状態において、ビス１４０の頭部はＰＣＢ１０１の裏面側で上記裏面パッド１０３と接触している。したがって、このようにＰＣＢ１０１とケース１２０とが、ビス１４０とインサートナット１２３により固着された状態においては、裏面パッド１０２と表面パッド１０３とがビス１４０、インサートナット１２３、及びスプリング１２５を介して電気的に接続されるため、メモリ１８は電源回路１４０から電源電圧を供給されると共に電池２４によりバックアップされている。

【００５４】上記構成において、パッド１０２，１０３、インサートナット１２１、スプリング１２５、及びビス１４０が図１に示すスイッチ２８に該当する。上述したように、ＡＰ．ＲＯＭ２０はＰＣＢ１０１の表面部側に実装されているため、ＡＰ．ＲＯＭ２０をＰＣＢ１０１から取り外すためには、ビス１４０を外す必要がある。しかしながら、ビス１４０を外すと、該ビス１４０を介して導通していた裏面パッド１０２と表面パッド１０３が非導通状態となるため、メモリ１８への電源回路４０及び電池２４からの電源電圧の供給は遮断され、メモリ１８の記憶内容は全て消去されてしまう。

【００５５】このように、図４に示す実装例においても、ＡＰ．ＲＯＭ２０を他のＡＰ．ＲＯＭに交換するなどの不当な目的で、該ＡＰ．ＲＯＭ２０をＰＣＢ１０１から取り外すと、一度とこの電子機器は作動しなくなる。

【００５６】次に、図５は上記図１及び図２に示す構成の実施例のさらに他の実装例を示す図である。この例では、図５(a)に示すように図１に示す各ブロックの電子部品が実装されたＰＣＢ２１０の一部にＡＰ．ＲＯＭ２１挿入用のＩＣソケット２２０を挿着する。また、このＩＣソケット２２０の内側に図１のスイッチ２８に該当するマイクロスイッチ２３０を載設する。このマイクロスイッチ２３０の押しボタン２３１の高さは、該ＩＣソケット２２０にＡＰ．ＲＯＭ２１を挿入したとき該マイクロスイッチ２３０が押下されてオンとなるような高さに設定する。

【００５７】したがって、工場出荷時には図１に示すスイッチ２８がオンとなるため、ＰＣＢ２１０に実装されたメモリ１８はバックアップ電源である電池２４から所定の定電圧が供給される。このため、メモリ１８に書き込まれたシステムデータは保持されると共に、初期化終了フラグもセット状態に保持される。

【００５８】そして、工場出荷後に、ある購入者がＡＰ．ＲＯＭ２０を不当に他のＡＰ．ＲＯＭに交換しようとするなどの不正な目的で、そのＡＰ．ＲＯＭ２０をＩＣソケット２２０から抜脱すると、マイクロスイッチ２３０がオフとなり、電源回路４０及び電池２４からのメモリ１８への電源電圧の供給は遮断される。そして、この結果として、メモリ１８の記憶内容は全て消去されるので、システムデータも消去され、初期化終了フラグもリセットされる。

【００５９】したがって、上述した図３及び図４に示す例と同様な効果が得られる。次に、図６に示すように、図１に示す回路においてメモリ１８に電源電圧を供給する電源が電池２４のみからなる場合の実装例を、図７に示す。

【００６０】同図において、メモリ１８が実装されたプリント回路基板（ＰＣＢ）２５０と他のプリント回路基板（ＰＣＢ）２６０とが、それぞれの四隅をビス２７０によってネジ止めされて、所定間隔、隔てながら互いに固定されている。

【００６１】この固定状態において、該ＰＣＢ２５０上には、弾性部材２８０が載設されており、この弾性部材２８０と上記ＰＣＢ２６０との間に電池２４が挟持され

ている。また、ＰＣＢ２５０に実装されたメモリ１８と上記電池２４とは、ＰＣＢ２５０上に形成されたプリント配線２５２と弾性部材２８０の表面に固着された不図示の配線部材によって電気的に接続され、メモリ１８は電池２４よりバックアップされるようになっている。また、特に図示してはいないが、ＰＣＢ２５０上にはＡＰ．ＲＯＭ２０も実装されている。このため、ＡＰ．ＲＯＭ２０を取り出すためにはビス２７０によってネジ止めされているＰＣＢ２５０とＰＣＢ２６０のいずれか一方を開かなければならない構造となっている。以上のような構成において、電池２４のプラス端子と上記弾性部材２８０に固着された不図示の配線部材との接触部が図１のスイッチ２８に該当する。

【００６２】そして、図４に示す状態にあるときに、誰かがＡＰ．ＲＯＭ２０を不当に別のＡＰ．ＲＯＭに交換しようとするなどの不正な目的で、ビス２７０を外し、ＰＣＢ２６０またはＰＣＢ２５０を開けると、弾性部材２８０上に不安定な状態で載っていた電池２４が弾性部材２８０の上から脱落し、該電池２４からメモリ１８への電源電圧の供給が途絶える。これにより、メモリ１８に記憶されていた上記システムデータが消去されると共に初期化設定フラグがリセットされる。この結果、上記図３乃至図５に示す例と同様に、再び図７に示す状態に戻したとしても、このシステムで再びＡＰ．ＲＯＭ２０に書き込まれているアプリケーション・プログラムを実行することは不可能となる。また、不当に交換されたＡＰ．ＲＯＭに書き込まれたアプリケーション・プログラムの実行も不可能になる。

【００６３】尚、上記弾性部材２８０として導電性を有する部材を用いれば、上記配線部材は不要となる。次に、図８はＡＰ．ＲＯＭ２０に書き込まれているプログラムを不正に解読しようとする、またはそのＡＰ．ＲＯＭ２０を他のＡＰ．ＲＯＭに不当に交換して、電子機器を別のアプリケーション・プログラムで作動させようとするなどの不正な行為を防止する電子機器の実装例を示す図である。

【００６４】同図において、２つのＰＣＢ３１０とＰＣＢ３２０は、上述した図７に示す例と同様に、それぞれの四隅をビス３３０によってネジ止めされて、互いに所定間隔の距離だけ隔てて固定されている。

【００６５】上記ＰＣＢ３１０上にはＥＰＲＯＭ（Erasable and Programmable Read OnlyMemory）から成るＡＰ．ＲＯＭ２０が実装されている。また、該ＡＰ．ＲＯＭ２０上には約15Wの電力が供給されたときに、波長が約2357Åの紫外線を約0.96秒間照射する、上記ＡＰ．ＲＯＭ２０の記憶データを消去するためのストロボ放電管３４０が搭載・固着されている。さらに、上記ＰＣＢ３１０と上記ＰＣＢ３２０との間には、一端が上記ＰＣＢ３２０に固着された絶縁性部材３５０が挟着されており、この絶縁性部材３５０の両側にはＰＣＢ３１０上に

その一部が固着された剛性を有する第１の導電性部材３６０及び第２の導電性部材３７０の先端が当接している。これらの導電性部材３６０，３７０の先端は弾性を有するように半円状に折り曲げられている。したがって、上記絶縁性部材３５０が取り外されると、上記２つの導電性部材３６０及び３７０の先端が互いに接触するようになっている。すなわち、上記３つの部材３５０，３６０，３７０は１つの検出スイッチを構成している。

【００６６】上記導電性部材３６０の他端は上記ストロボ放電管３４０の電源入力端子と接続されており、もう一方の導電性部材３７０の他端はＰＣＢ３１０上に形成されたプリント配線を介し、不図示の電池に接続されている。

【００６７】このように、ＡＰ．ＲＯＭ２０は、ＰＣＢ３１０とＰＣＢ３２０との間に介装されているため、ＡＰ．ＲＯＭ２０を取り出すためには、ビス３３０を外してＰＣＢ３２０を開ける必要がある。しかし、このような行為を行うとＰＣＢ３２０と共に絶縁性部材３５０も引き抜かれるために、上述のような理由により導電性部材３６０と導電性部材３７０のそれぞれの先端が接触し、ストロボ放電管３４０に前記電池から約15Wの駆動電力が供給される。これにより、ストロボ放電管３４０からＥＰＲＯＭから成るＡＰ．ＲＯＭ２０の紫外線透過窓に波長が約2357Åの紫外線が約0.96秒間照射され、ＡＰ．ＲＯＭ２０に書き込まれた内容、すなわちアプリケーション・プログラムの内容は全て消去される。したがって、出荷された電子機器のＡＰ．ＲＯＭ２０に書き込まれたアプリケーション・プログラムの解読は不可能となる。

【００６８】尚、この例では、ＡＰ．ＲＯＭ２０にＥＰＲＯＭを用いているが、ＥＰＲＯＭの代わりに、例えばＥＥＰＲＯＭ（Electrically Erasable Programmable ROM）を用いてもよい。この場合には、例えば、上記ＰＣＢ３２０が開けられたことを検出するスイッチを設け、この検出スイッチからの信号を受けマイクロプロセッサが上記ＥＥＰＲＯＭの記憶内容を消去するような構成とする。

【００６９】また、前記図５に示す例の変形例として、上記ＩＣソケット２２０にＡＰ．ＲＯＭ２０以外のＩＣ（例えばメモリ１８）を挿入するようにし、そのＩＣがＩＣソケット２２０から抜き取られた際のマイクロスイッチ２３０の検出信号により、ＥＰＲＯＭまたはＥＥＰＲＯＭ等の消去可能なＲＯＭから成るＡＰ．ＲＯＭ２０の記憶内容を全て消去するようにしてもよい。このような構成とした場合、上記ＩＣソケット２２０にメモリ１８を装着するようにすれば、出荷後の電子機器に対して不正な行為が行われた場合、ＡＰ．ＲＯＭ２０の内容のみならずメモリ１８の内容も同時に消去可能となる。

【００７０】

【発明の効果】以上説明したように、請求項１乃至５記

載の発明によれば、予め定められたデータをメモリに書き込んでおき、所定のプログラムの起動に際して、前記メモリに前記データが記憶されているか否かを検出し、そのデータが記憶されていないことが検出された際には、前記所定のプログラムの起動を行わないようにするので、マイコン制御の電子機器において、無断で作成された不正のプログラムを起動させないようにすることができる（正規のプログラムでなければ動作させないようにすることができる）。また、上記電子機器を不法に改造しようとして、内部を開けた場合に、以後その電子機器が正常に動作しないようにすることができる。

【００７１】請求項６記載の発明においては、プログラムもしくはデータを記憶する消去可能なＲＯＭ及びこの消去可能なＲＯＭの記憶内容を消去する消去装置が実装された部品担持体を有し、この部品担持体を覆う基体と前記部品担持体との間隔が開かれた際に、これを検出する検出スイッチを設け、この検出スイッチの状態変化に応答して前記消去装置を駆動して前記消去可能なＲＯＭの記憶内容を消去するようにしたので、マイクロコンピュータが組み込まれている電子機器において、その機器に実装されているプログラムの解読を禁止でき、不正ソフトの作成を防止できる。

【図面の簡単な説明】

【図１】本発明の一実施例の電子機器のシステム構成を示す回路ブロック図である。

【図２】上記実施例におけるＣＰＵの動作を説明するフローチャートである。

【図３】上記実施例の第１の実装例を示す図である。

【図４】上記実施例の第２の実装例を示す図である。

【図５】上記実施例の第３の実装例を示す図である。

【図６】メモリ用の電源が電池のみから成る回路例を示す図である。

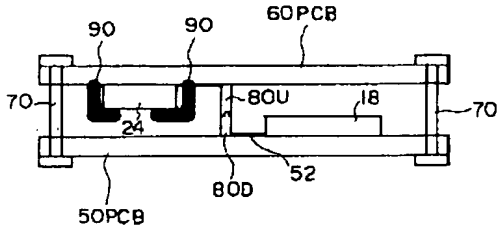
【図７】メモリ用の電源回路が図７に示す構成となっているときの、上記メモリと上記電池の実装例を示す図である。

【図８】ＡＰ．ＲＯＭとしてＥＰＲＯＭを用いた場合の実装例を示す図である。

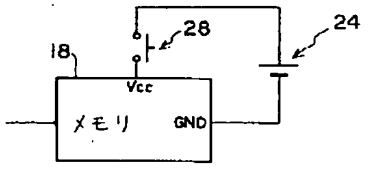
【符号の説明】

１０　電子機器の回路
１２　ＣＰＵ
１４　ＯＳ．ＲＯＭ
１６　ＩＰ．ＲＯＭ
１８　メモリ
２０　ＡＰ．ＲＯＭ
２２　Ｉ／Ｏコントローラ
２４　電池　２８　スイッチ
４０　電源回路
４２　電源スイッチ
５０，６０，１０１，２１０，２５０，２６０，３１０，３２０　プリント回路基板（ＰＣＢ）
７０，１４０，２７０，３３０　ビス
８０Ｄ　雄コネクタ
８０Ｕ　雌コネクタ
９０　支持体
１０２　裏面パッド
１０３　表面パッド
１２０　ケース
１２１　ケースの突起部
１２３　インサートナット
１２５　スプリング
２２０　ＩＣソケット
２３０　マイクロスイッチ
２５２　プリント配線
２８０　弾性部材
３４０　ストロボ放電管
３５０　絶縁性部材
３６０　第１の導電性部材
３７０　第２の導電性部材

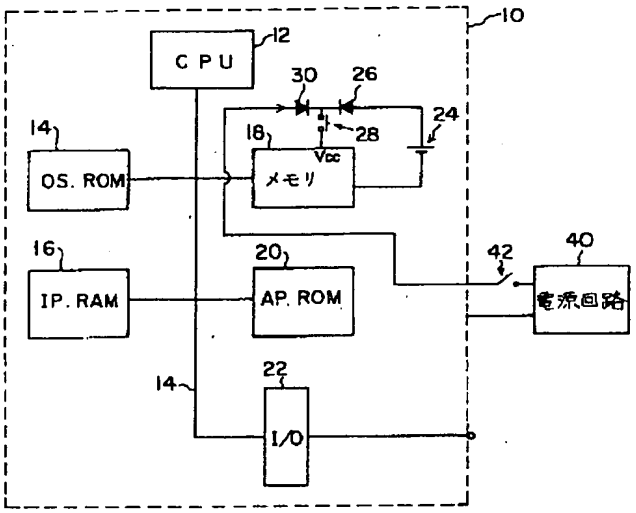
【図３】



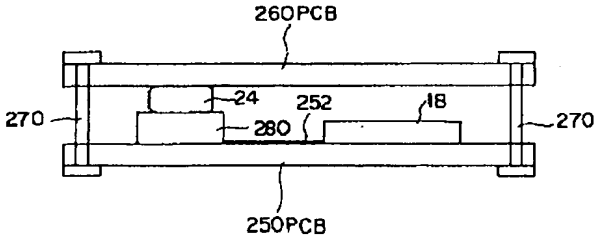
【図６】



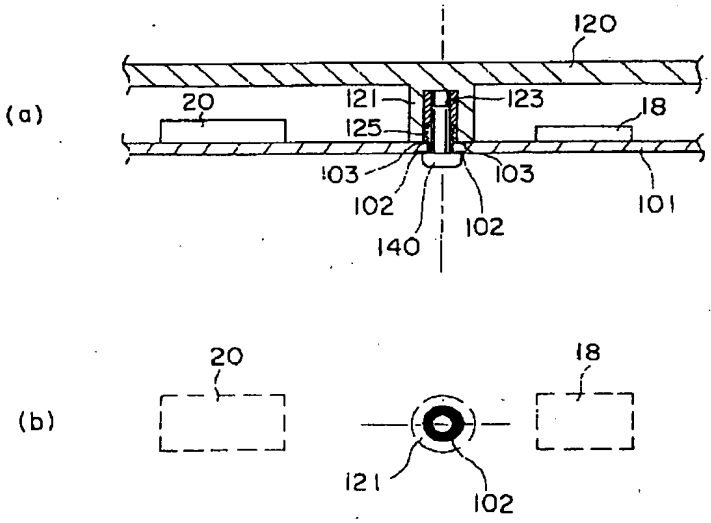
【図１】


10
CPU
12
30
26
24
28
14
18
Vcc
OS. ROM
メモリ
16
20
42
40
IP. RAM
AP. ROM
電源回路
14
22
I/O

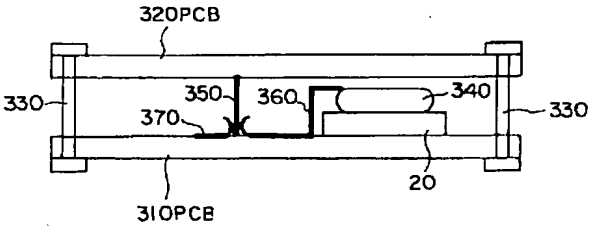
【図７】


260PCB
24
252
18
270
280
270
250PCB

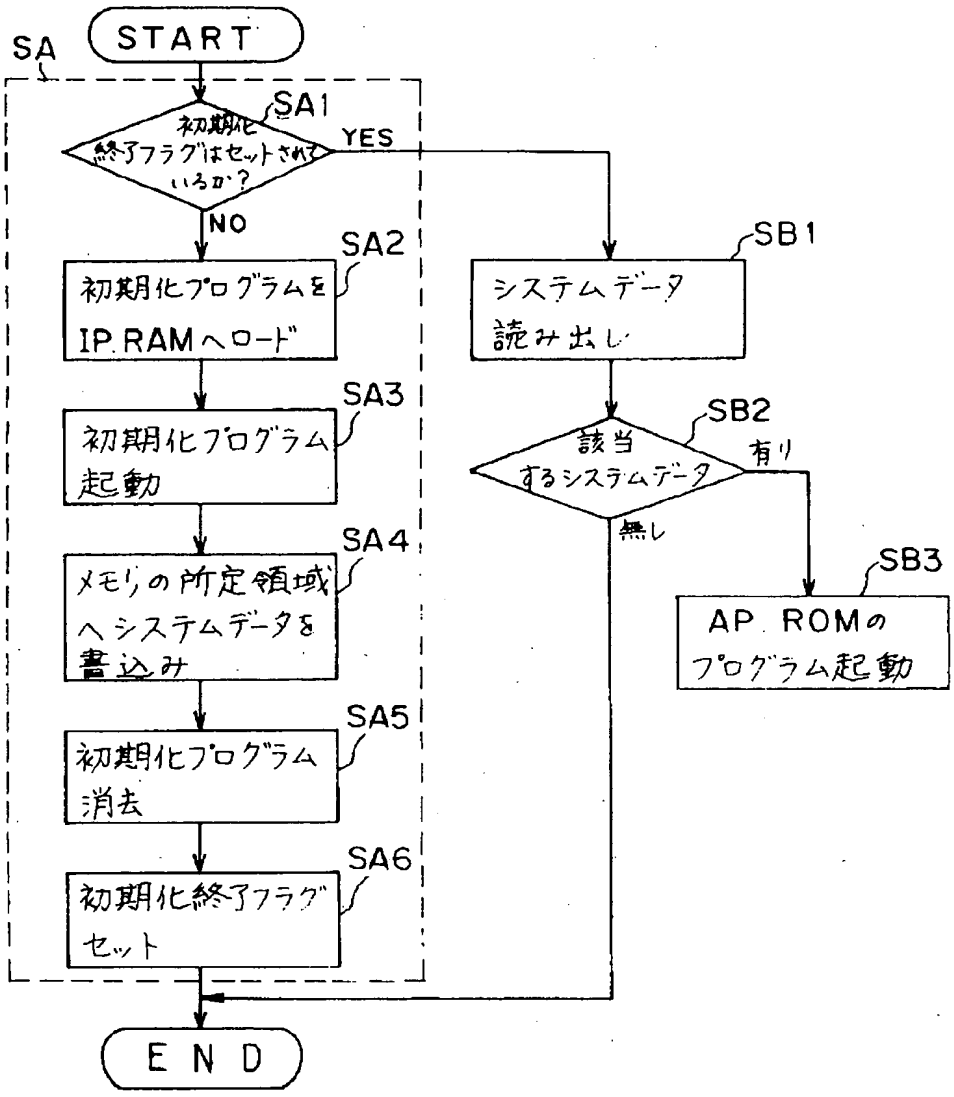
【図４】


(a)
120
20
121
123
18
125
103
103
102
102
101
140
(b)
20
18
121
102

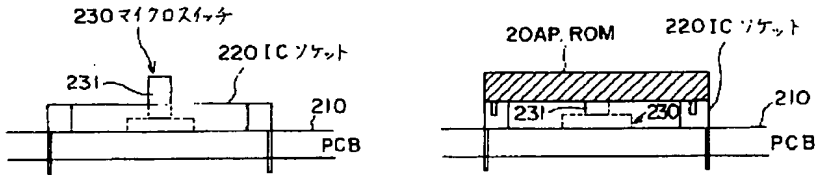
【図８】


320PCB
330
350
360
340
330
370
20
310PCB

【図2】



【図5】



AP. ROM未実装　(a)

AP. ROM実装　(b)

フロントページの続き

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